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CONDUCTED BY

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(Assisted by several Scientific Gentlemen.)

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No. CCXLVII.

RECENT PATENTS.

To Thomas Beale Browne, *of Hampen, near Andoversford, in the county of Gloucester, Gent., for improvements in weaving and preparing fibrous materials, and staining or printing fabrics,—being a communication.*—[Sealed 24th October, 1850.]

This invention consists, firstly, in a novel system of weaving, whereby double or treble widths of fabric are made in looms of less width than the fabric woven; secondly, in an improved beat-up motion for the batten of the loom, whereby a double beat-up may be effected without suspending the action of the other parts of the loom; thirdly, in an arrangement of flax-dressing machinery, whereby the operations of breaking, scutching, and heckling may be performed in one and the same machine; and, fourthly, in an arrangement of machinery for staining or printing woven and other fabrics.

In order to produce a wide cloth in a narrow loom (say two or three times the width of the loom), the patentee beams on one or more beams two or three times the quantity of warp that would be requisite for weaving cloth of the breadth of the loom: thus, if it be desired to weave a cloth of two yards in width in a yard-wide loom, a double quantity of warp is placed in the loom, either on the same beam or separate beams, and passed through a double set of harness, so as to form two sets of warp-threads, which are put through the reed in the ordinary manner; and each set is acted upon alternately, to form a shed for the passage of the shuttle. The shuttle passes alternately through the two sets of warp-threads; but, instead of weaving two distinct cloths, one

below the other, it produces a single piece of fabric, which, when opened out, will present the same appearance as if it were woven in a wide loom. The following description will serve to illustrate the mode of operation:—The two sets of warp-threads being properly arranged in the loom in a double set of harness, the weft is first passed through a shed, formed by raising one half of the upper warp which is to produce the upper part of the cloth (this is effected by sinking three of the treadles and raising one), and, when the weft is thrown in, the batten is beaten up; then the whole of the upper set of warp-threads, and also one half of the lower set, are lifted, the shuttle is thrown back again, and the batten again beaten up; then the second half of the lower warp is raised (the whole of the upper warp remaining up) and the first half of the lower warp taken down, and the weft is again thrown in and beaten up; then all the lower warp and the second half of the upper warp go down,—the remaining half of the upper warp being raised, and the weft thrown back again; and so on until the piece is completed. To render this explanation clearer to the practical weaver, the patentee has shewn in the diagram, fig. 1, Plate I., what is technically called the drawing of the tie. This mode of weaving only produces a tabby tie; but any other ties may be made, at the will of the weaver. The cloth, so woven, will be double the width of the warp, and will be folded, like a piece of note-paper, upon the take-off roller of the loom, as shewn at fig. 2.

If required, the cloth may be treble the width of the loom, as shewn at fig. 3: in which case, three times the quantity of warp that would be necessary for one cloth must be put on the beam and passed through the reed;—the tie would be a little altered; but the principle of weaving would be the same.

Unless some means be taken to prevent the drawing-in of the warp-threads at the fold or folds, the appearance of the fabric, when opened out to its full width, will be injured; as a white mark or stripe will be seen down the middle of the piece. In order to prevent this, the reed must be so arranged that, at that division of the warp where the fold or folds come, the last half dozen, more or less, of the dents, will be set somewhat further apart, and made gradually thicker than at the other parts of the reed: it is preferred that these dents should be soldered together at the top and bottom, at their proper distances, so that they may remain stiff and not yield to the pull of the weft-threads or yarns. By this means, an allowance will be made for the lateral pull made by the weft-threads

upon the warp at the fold or folds of the cloth, and thus prevent the last few warp-threads from being pulled in thereby.

The improved beat-up motion is exhibited at fig. 4,—the object being, to give two beats-up for every pick of the shuttle, and thus to produce close and firm work, without suspending the action of the other parts of the loom. *a*, represents the batten or shuttle-race of the lathe. *b*, is the lay-sword, working on the fulcrum *c*, and connected to a stationary part of the back frame *d*, of the loom by a toggle-joint-attachment *e*; from the middle joint *f*, of which depends a connecting-rod *g*, that communicates motion from the crank *h*, on the main driving-shaft *i*, to the lay-sword *b*. The drawing represents the position of the parts when the batten is driven home. It will be seen that, for every throw of the crank, the toggle-joint will be made to act twice upon the lay-sword *b*, and thereby effect the beating-up of the weft twice. The period at which this operation is performed is, when the crank-arm *g*, by the motion of the crank *h*, arrives at either of the positions indicated by the dotted lines 1, 2. The motions of these parts of the loom are as follow:—Suppose the second beating-up to have just taken place, the rotation of the driving-shaft *i*, in the direction of the arrow, will bring the arm *g*, into the position indicated by the dotted lines 3; whereby the toggle-joint *e*, will be made to draw the lay *b*, into its farthest backward position, as shewn by the lines 3*; and, at the same time, an open shed will have been formed by the harness in the usual way, to receive a fresh shoot of weft. This shoot being thrown into the shed at this moment, the crank, by its continued rotation, will bring the arm *g*, to the position of the dotted line 1, and thereby straighten the toggle-joint, and effect the first beat-up of the weft. By the crank continuing to move round, the arm *g*, will be brought to the position shewn by the dotted line 4; and, by thus bending upwards or shortening the toggle-joint *e*, it will draw back the lathe into the position indicated by the lines 4*, preparatory to another beat-up, which will take place on the crank-arm *g*, arriving at the position indicated by the line 2,—when the toggle-joint will be again straightened, and the lathe will beat up a second time.

The third part of the invention relates to a novel combination or arrangement of parts, whereby the several operations of beating, scutching, and heckling flax or hemp, may be performed in one machine.

The flax or hemp-straw to be operated upon is secured in holders in the ordinary way; and these holders, being placed

A 2

in the machine, are conducted along rails by means of an endless band, which will gradually draw the holders forward into and through the machine. The first operation to which the flax or hemp-straw is submitted is a crushing or rubbing process, for the purpose of loosening the woody parts from the useful fibre. This operation is effected by means of pairs of vertical rollers, to which a peculiar vibrating or rubbing motion is communicated; and the patentee prefers that one of each pair of these rollers should be indented, and the other plain, or but very slightly indented. After the flax has passed between these rollers, the woody parts will be completely broken; and this refuse matter is removed from the useful fibre by means of rotary scutchers, with serrated edges, which are gradually made with finer teeth as the distance from the beating or rubbing rollers increases. After the flax or hemp has been acted on by the scutching apparatus, it is conducted to the rotary heckles, which form a continuation of the rotary scutchers; and the flax or hemp-straw will come out of the machine perfectly heckled.

Fig. 5, is a side elevation of the machine; and fig. 6, is a plan view of part thereof,—the cover or casing which envelopes the whole machine being removed, the better to shew the construction and arrangement of the parts. The holders *a*, in which the flax or hemp-straw is secured in the usual manner, are placed upon rails *b*, extending from end to end of the machine, and are carried forward by means of an endless band *c*, which passes over two pulleys *d*, *d**, one at each end of the machine, and is furnished with projecting pieces or "snubs," that catch against the holders *a*, and draw them forward. Motion is communicated to one of the pulleys *d*, *d**, from the driving-shaft *e*, by means of bevil gearing *f*, *f*, and a worm and worm-wheel *g*, on the axle of the pulley. The rubbing or crushing operation is effected by the pairs of rollers *h*,—one of each of these pairs of rollers being grooved, and the other plain. The two rollers forming each pair are geared together by toothed wheels at their lower ends; and the bearings of one is furnished at both ends with a spring, so as to allow it to yield as the straw passes between them. In order to prevent the fibres from lapping round the rollers, the latter are grooved at 3, (see fig. 5); and two wires 4, are passed between the rollers, and secured to the standards of the framing. A horizontal vibrating motion is communicated to all these rollers by means of an endless pitch-chain *i*, which passes round, and is driven by, the horizontal wheel *j*. A vibrating motion is imparted to this wheel by a pin *p*, at the

end of the connecting-rod *k*, actuated by the crank *l*, at one end of the horizontal shaft *m*; on the opposite end of which shaft is mounted a bevil-wheel *n*, that gears into a similar wheel on the shaft *o*, which is driven by bevil-gearing connected with the main driving-shaft. It will be seen, on referring to fig. 6, that the wheel *j*, is provided with a number of pins or studs 1, between which the pin *p*, of the rod *k*, works; so that, as the crank *l*, rotates, it will impart a horizontal vibrating motion to the wheel *j*; and a similar motion will, by means of the chain *i*, be communicated to the vertical rollers *h*, *h*. It will, however, be necessary that these rollers should gradually move round on their centres; and this is effected at every third rotation of the crank, by means of a cam-wheel *q*, on the end of the shaft *r*. The shaft *r*, carries, at its opposite end, a large bevil-wheel, which gears into, and is driven by, a bevil-pinion on the shaft *o*; so that, at every third rotation of the crank *l*, the larger diameter of the cam *q*, will come round and lift the connecting-rod *k*, and pin *p*, and will drop the pin *p*, between other studs of the wheel *j*, which, as the crank *l*, continues to rotate, will be pushed round, and thereby shift round all the rollers *h*, *h*.

By the slow but continuous progressive motion of the endless band *c*, the holders, with the rubbed or crushed straw, will be carried forward to the scutchers *s*. These scutchers, which may be made of wood or metal, are formed with serrated edges, and affixed to a wooden framework *s**, (seen best in the transverse section, fig 7); and, as they revolve, their serrated edges partially enter the straw, and scrape off or detach the woody parts from the fibre. The indentations in the edges of the scutchers gradually increase in fineness, according as the distance from the beaters increases. By this means, the fibres become partially heckled in the scutcher, previous to entering the heckling part of the machine. The rotary scutchers are driven by toothed wheels *t*, *t*, one of which is mounted on the main shaft *e*. The straw, in its passage through the machine, is warmed by means of a steam pipe *u*, which extends from end to end of the operative part of the machine; and thereby the fibre becomes gradually softened as it approaches the finishing process. It is found advisable to enclose the several parts of the machine with separate cases; and the scutching-case is divided into two or more parts, so that the refuse may be collected according to its value; and, for the purpose of drawing off the dust, it is found convenient to exhaust the compartment which encloses the first part of the scutching apparatus, by means of a blower or fan.

After leaving the scutching apparatus, the flax or hemp enters the heckling apparatus, which is shewn in section at fig. 8. The rotary heckles are driven by a train of gearing, actuated by a toothed wheel on the main driving-shaft *e*; by which means a much slower motion is given to the heckles than that at which the scutchers revolve. The principal improvement in this part of the apparatus is in the form of the teeth, which are shewn detached, and upon an enlarged scale, at figs. 9. The tooth *v*, is made round in the usual way; but at its lower end, and near the part which is inserted in the wood, it is gradually reduced in thickness, to give it a little flexibility, and allow it to yield to the work. The teeth *w*, which are shewn in edge, side, and end views, are made of a flat oval form, and are fixed in the wood in such a manner as to present their flat sides to the work, whereby they will be capable of yielding, as in the former instance. The rotary heckles are enclosed in a casing; and the doffing-rollers and combs are adapted thereto, and actuated in the usual manner. It will only, therefore, be necessary further to state, that the heckle cylinders, as well as the rotary scutchers, are mounted in adjustable bearings, so as to admit of the cylinder and heckles being moved nearer to or further from each other, as may be required.

The last part of the invention relates to an improved apparatus for staining or printing fabrics, and consists in mounting the blocks or forms, to be printed from, on horizontal travelling tables, connected to the outer ends of radial arms; and causing such tables, with the forms thereon, to travel on rails round a centre, and pass under impression cylinders, which will give an impression every time the forms pass under them. Fig. 10, represents a plan view of an apparatus constructed on the improved plan, and fig. 11, is a side elevation thereof. A, is the main central shaft, from which the horizontal radial arms B, extend. The ends of these arms are slotted, for the purpose of receiving the centre pins F, of the travelling tables C, upon which the forms or blocks to be printed from are secured. On the under sides of these tables are antifriction wheels or rollers D, which run upon the railway E, supported by strong pillars or masonry. The impression-cylinders G, are mounted on strong horizontal pins or shafts, extending out from the standards H. An inking or color apparatus is shewn at I; but it will, of course, be understood, that, for every printing-table and form, there must be an inking or color apparatus, and an impression cylinder,—although only one inking or color apparatus is shewn.

The operation of the machine is as follows:—Upon motion being communicated to the central shaft from any prime mover, the travelling tables will be carried round under the inking or color rollers I, from which the blocks or forms, placed thereon, will receive a proper supply of color; and the forms will then pass under the impression cylinders, to which the paper or other fabric to be printed is fed, either in the ordinary manner, or by the means hereafter described; and as the tables and forms or blocks travel onward, the paper or other fabric is delivered on the opposite side of the cylinder in a printed state. The patentee remarks, that he does not intend to confine himself to any given number of printing cylinders and forms, as six, eight, and even more, may be used advantageously; and he also observes, that the tables and forms are always made to travel in a straight line whenever they are performing the operation of printing. On the axle of the printing cylinder is a toothed wheel *x*, which works in a rack *y*, on the side of the travelling table; so that the cylinder never moves until the rack of the travelling table comes in contact with it, and drives it round,—thereby carrying in the paper or other fabric to be printed, and bringing it in contact with the inked form or block from which it receives the impression.

The paper or fabric to be printed is fed up to the cylinder, and is carried into the machine, by fingers, nippers, or tapes, in the ordinary way; but when single sheets of paper are to be fed in, and if great rapidity is required, the patentee employs the feeding apparatus shewn at fig. 12, in which the paper is piled upon a sloping table K. Previous to setting the apparatus in motion, the attendant must push down the paper, in the usual manner; and then a revolving circular brush or roller H, with an uneven or roughened surface, will carry down sheet after sheet to the gauges, from which the sheets will be laid hold of and carried into the machine by the fingers or nippers of the impression cylinder. The rotary brush or roller H, is mounted in bearings in the lever I, which will admit of the brush or roller rising or falling according to the quantity of paper on the sloping table K; and it is kept constantly rotating by means of a cord or band J, which passes over a pulley on its axle. At the lower end of the sloping table K, is a long slot 2, into which descends a roller L, carried by the end of the lever M,—a similar lever being placed on the other side of the table. As the paper is drawn or pushed forward by the action of the roller H, it passes across the slot 2, and under the roller L, which being properly

balanced by the weights N, at the other end of the levers M, is raised by the paper passing under it. The back end of the lever M, is jointed to the lever I, which carries the rotary brush. It will therefore be seen, that, as the paper is drawn down by the brush H, and raises the roller L, the opposite end of the lever M, will be depressed; and, by acting in a corresponding manner on the lever I, will lift the brush H, off the paper, and prevent it from pushing down any more until the sheets which have been pushed down are drawn away by the fingers or nippers of the printing cylinder;—the roller L, will then descend again into the slot, and allow the brush to descend likewise and push forward another sheet; and so on, until all the sheets are carried in. It will be necessary, from time to time, for the attendant to push forward the pile of paper, so as to bring it under the action of the rotary brush or roller.

When the sheets of paper are large, it will be advisable to employ two or more rotary brushes or rollers, to assist in drawing the sheets off the pile. The rotary brushes or rollers H, may be covered with gutta-percha, and the surface must be roughened. Or if a brush is employed for the purpose, it is preferred to construct it in the manner shewn at fig. 12; as brushes have been found to act more satisfactorily when a portion of the bristles are inclined to the periphery of the roller, instead of all of them radiating from the centre.

The patentee claims, First,—weaving wide fabrics in looms of less width than the fabric woven,—such object being effected by the employment of two or more sets of warps, ranged one above the other in the same reed, and tying the edges of the separate warps together, as shewn and described, so as to leave two perfect salvages. Second,—for producing a double beat-up in looms, he claims the use of a toggle-joint, or jointed arm, in combination with the crank and connecting-rod, as described. Third,—in relation to machinery for preparing fibrous materials,—he claims the general arrangement of the machine, as shewn and described, whereby the several operations of rubbing or crushing, and scutching, and heckling the flax, or hemp, or other fibrous straw, may be carried on continuously in the same machine; also, separately, the arrangement shewn and described, or any mere modification thereof, for crushing or rubbing the flax, or hemp, or other fibrous straw—particularly the use of pairs of vertical rollers, to which a vibrating motion is communicated; further, the employment of rotary scutchers with serrated edges, as shewn and described; and also the peculiar form of heckle-

pins shewn and described. Fourth,—as regards staining and printing fabrics,—the use of the travelling beds on which the forms or blocks are secured, and which are carried round a centre, on rails, in such a manner that, during the printing operation, the beds must always travel in a straight line; also, the apparatus shewn at fig. 12, or any modification thereof, for feeding-in the sheets of paper; and the patentee claims this apparatus, whether employed in combination with the printing apparatus above described, or applied to any other printing machine.—[*Inrolled April,* 1851.]

To RICHARD SHIERS, *of Oldham, in the county of Lancaster, manufacturer, and* JAMES HEGINBOTTOM, *of the same place, manager, for improvements in the manufacture of textile fabrics.*—[Sealed 2nd December, 1850.]

THESE improvements relate, firstly, to the production of those fabrics commonly denominated cotton tabby velvets, cotton Genoa velvets, and cotton velveteens; and consist in using the floating or pile picks of weft, or a portion of them, twice or more, between the operation of any two of the binding threads, thereby giving more floating weft to the face of the fabric in proportion to the back, and consequently producing a fuller surface. Secondly, they relate to an arrangement of apparatus constituting a self-acting temple,—the peculiar feature of novelty consisting in the employment of a rod or spindle, situate within the selvage of the work, and kept in position, so as to effect a correct tension of the cloth, by suitable apparatus. Thirdly, they consist in the application of parts, similar to the improved temple, for the purpose of effecting a parallel motion of fabrics, such as cords, velvets, velveteens, and fustians, during the operation of cutting

The first improvement is illustrated by the diagram, fig. 1, in Plate I., which represents the section of a piece of velvet woven according to the most ordinary method,—the weft being floated over five warp-threads. According to such plan, there are eight picks to constitute a round of work. The first motion of the tappets produces what is called the "back binder;" the three following dispose the warp-threads so as to receive a like number of floating picks; after which, the middle binding is effected and the course completed by three other floating picks. In order to effect the improvement, the tappets, or other apparatus for shedding the warp, are so arranged, as to obtain a greater number of picks to the round,—such

additional picks being used for floating the weft-thread over the warp; while those which effect the binding of the yarns are used as in ordinary velvet or velveteen weaving. Thus, in the diagram, fig. 1, supposing the "back binder" to have been worked, the patentees float, at three picks, the threads represented by the lines marked 1, 2, 3; after this, the usual operation would be to effect the middle binding; but, according to this improvement, the floating represented by the lines 1, 2, 3, is repeated, and then the middle binding takes place;—the same operation being carried on between this and the next binding shed. Instead of working the three floating threads one after the other, as above described, and repeating the operation in that order, the thread 1, (for instance,) may, if desired, be floated twice following; then that indicated by the line 2, the same number of times; and, subsequently, the thread 3, may perform the same movements: in such case, however, the warp-threads must be so worked as to secure the necessary selvages. In the preceding remarks, the weft-thread is spoken of as being used so that each of the picks shall float over the warp twice between a binding shed; if desired, however, only a portion of them may be so used; or, instead of twice only, the whole, or a part of them, may be floated a greater number of times between the bindings. Although the improvement has been described above as adapted to the most ordinary method of weaving such fabrics as aforesaid,—that is to say, the use of a weft-thread floating over five warp-threads,—it will be evident that the improvement may be employed where less or more warp-threads are used between each floating: for instance, in that arrangement for which letters patent were granted to Charles William Kesselmeyer, and Thomas Mellodew, November 2, 1848*, and according to which the fabric is produced by combinations of eight, nine, or more warp-threads with the weft. In order to adapt the present improvement to this method, it will merely be necessary to increase the number of picks to the round, and apply them for producing a repetition of the floating, as before mentioned. Although the improvement has been stated to relate to cotton velvets and cotton velveteens—such being the terms usually employed to denote the class of fabrics—yet, if desired, other fibrous materials, as wool or flax, may be introduced in the manufacture.

The self-acting temple is shewn at figs. 2, 3, 4, 5, 6, and 7. Figs. 2, 3, and 4, are detached views, on a large scale, of the parts which immediately operate upon the fabric; and as

* For description of this invention see Vol. xxxiv. of our present Series, p. 102.

these exemplify the principle of operation, the patentees first describe them, and, subsequently, the application of the same to a loom. *a*, is a boss of brass, or other suitable material, mounted so as to be capable of sliding loosely upon a rod *b*, and pressed forward thereon by a spiral spring *c*, until prevented from moving further by a stop-pin *d*. Within the boss *a*, is formed a circular socket *e*, extending through one end a^1, but partially closed at the other a^2; and throughout the length of the boss *a*, is also formed a slot *f*, communicating with the circular socket *e*. The selvage of the cloth to be kept distended is to be woven double; or, in cases where double cloth is produced in the loom, such method of weaving will afford the required condition. This doubly-woven part is to be introduced through the slot *f*; so that a loop of the fabric will be situate in the circular socket *e*; and in the loop, a short spindle *g*, is to be placed,—one end thereof being towards the closed part a^2, and being, consequently, prevented from moving further in that direction. Suppose one of these apparatus affixed to any suitable stationary part at either side of the loom, and each looped selvage placed therein, it is evident that the fabric may be thereby held distended to any width. As the weaving proceeds, the cloth will be drawn forward, by the usual taking-up machinery, in the direction of the arrow fig. 4; and the loop at each side of the cloth, therefore, slides upon the short spindle *g*, and passes onward through the longitudinal slot *f*,—such slot being formed in the boss *a*, as far as the diameter of the circular socket *e*: that is, as far as the cloth itself extends. This motion of the work will have a tendency to carry forward the spindle *g*; but as the socket *e*, is partially closed at that end through which it would have to pass, it is there arrested, and the cloth alone moves forward. By the application of the spring *c*, the boss *a*, will possess a capability of yielding to a certain extent, so as to compensate for unequal tension of the work. For some cases of weaving, the improved temple may be used simply as described,—that is to say, an apparatus, similar to the foregoing, may be applied to any stationary part at either side of the loom; but, in general, the patentees prefer to mount the apparatus in such manner that a loosening of the tension may be occasionally effected, so as to admit of the work being drawn forward more easily; and they describe a method by which this operation may be effected, without, however, intending to confine themselves thereto.

Fig. 5, is a partial end elevation of a loom with the improvement applied; fig. 6, is a sectional elevation, taken at

the line 1, 2, and looking towards the left-hand of fig. 5; and fig. 7, is a plan view,—a portion of the breast-beam being removed at either end, in order to expose the parts which are situate beneath. In these figures, the loosening apparatus is shewn differently constructed at each end of the loom, in order to explain slight modifications thereof. The operation is first described in reference to the left-hand apparatus of fig. 6:—The boss *a*, is mounted upon a rod *b*, which, in this instance, is affixed to an upright stud *h*, mounted so as to be capable of turning in the breast-beam *i*, of the loom, and in a bracket attached thereto. Upon the lower end of the stud *h*, is affixed a bell-crank-arm *j*, one end of which is formed with a notch, that projects against a latch *k*: which latch is mounted so as to be capable of turning upwards upon a fixed centre, but is continually drawn downwards through the intervention of a weighted cord *l*. The cloth, stretched to its proper width, has a tendency to draw the boss *a*, through which it passes, in the direction of the arrow, fig. 7; but is prevented from so doing by the situation of the bell-crank-lever against the latch *k*, until the latter shall have been raised. The latch is raised in the following manner:—Upon a stud, affixed to the framework of the loom, there is mounted a ratchet-wheel *m*, which, at every advance of the lathe, is caused to move through the space of one tooth by the agency of a driving-click *n*, and is prevented from revolving in the other direction by a detaining-click *o*. On the side of the ratchet-wheel there is a projecting stud *p*, which arrives, on the completion of each revolution, in contact with an inclined piece affixed to an upright spring *q*, so as to force it inwards at stated intervals. The spring *q*, at its upper end, is situate between two pins projecting from a bar *r*, which is capable of sliding backwards and forwards in guide-pieces *s*, and carries with it a piece *t*, that extends beneath the under side of the latch *k*. Therefore, upon the spring *q*, being caused to move inwards, its upper end will carry forward the bar *r*, and with it the piece *t*, which, moving along the inclined side of a nib *u*, will lift the latch *k*, free from the arm *j*, so as to allow the tension of the cloth to draw the temple *a*, inwards, by turning the stud *h*, upon its centre of motion, as shewn by the dotted lines in fig. 7. This operation effects a loosening of the woven loop within the socket *e*, so as to admit of the fabric being readily drawn forward. At the next vibration of the lathe, a piece *v*, will arrive in contact with the projecting part *j**, of the arm *j*, and force it backward to its former position,—causing the stud *h*, to turn back upon its centre and again stretch the

cloth to the desired width; during which operation the ratchet-wheel *m*, will have been carried forward another tooth, so as to move its stud *p*, free from the spring *q*; and this spring will then, by its elasticity, draw back the sliding-rod *r*, so as (by liberating the part *t*, from the inclined nib *u*,) to allow the latch *k*, to fall into its former position, and secure the arm *j*, as before described.

In the modification of the apparatus at the other side of the loom, instead of the latch *k*, there is a stationary piece *w*, affixed to the sliding-bar *r*, in a suitable position to act with a notch of the arm *j*. The sliding motion of the bar *r*, at the same time that it lifts the latch *k*, will carry the fixed piece *w*, beyond the end of the notch of the arm *j*, which will then be at liberty, so as to allow the spindle *h**, to turn upon its centre and effect the desired slackening of the temple. The next vibration of the lathe will restore the tension, as already explained, by bringing the piece *v**, in contact with the arm *j**; and the return motion of the sliding-bar *r*, will again bring the piece *w*, into the requisite position, with reference to the arm *j**, for keeping the cloth distended. The intervals at which the slackening of the cloth shall take place, may be regulated at pleasure, by altering the number of teeth in the ratchet-wheel, so as to bring its tappet *p*, more or less frequently into contact with the inclined plane of the spring *q*.

The loops may be woven at the selvages of the cloth by any ordinary method: the warp-threads A, B, for instance, of the necessary width, being connected to shafts distinct from those of the other part of the cloth, and having shedding motion imparted thereto suitable for the production of double cloth, as is well understood. When the whole width of fabric is produced double, the additional shafts will not of course be required.

The improved method of keeping fabrics distended, so as to move in a parallel direction during the operation of cutting, is shewn applied to the machine represented in vertical section at fig. 8. The fabric intended to be cut is to be woven with loops at the selvages, or woven double, as before mentioned. The work-beam is then placed in a suitable framework, and the cloth conducted through an apparatus, as shewn at *a*, similar to that described in reference to figs. 2, 3, and 4. In this instance, an occasional slackening of the fabric is not required; the temple is therefore fixed by bolts, or other suitable means, to the framework of the machine. From thence the fabric is passed around rollers *b*, *c*, *d*, and between bars at *e*, *f*, *g*, *h*, to a beam *i*,—passing pre-

viously, if desired, through another guide-temple at the place marked C. The guides or temples are to be applied at each selvage of the cloth; and, in some cases, it may be desired to mount those which are situate on one side with springs, or weighted levers, so as to be capable of yielding to any inequality in the width of the fabric. The machinery for drawing on the cloth may be of any convenient construction; and, if found necessary, toothed wheels, having rotatory motion imparted thereto, may be employed for assisting the operation, as shewn at *j*, *j*,* *k*. The cutting may be effected by hand, with the ordinary knives, or they may be attached to bars placed across the machine,—sufficient being employed to effect the cutting of the whole of the loops, and space gained for the necessary number by placing them on the bars so that each knife of a series shall occupy a position corresponding to a space between two of an adjacent bar.

The patentees claim, Firstly,—as applied to the production of such fabrics as aforesaid,—so regulating the motions of the threads that the round of floating or pile picks, or a portion thereof, shall come into operation twice or more between a binding; Secondly,—as applied to looms for weaving,—the employment of rods or spindles, situated within loops formed at the sides of the fabric, for the purpose above set forth; Thirdly,—the employment of rods or spindles, situate as aforesaid, for the purpose of causing looped or pile fabrics to move in a parallel direction during the cutting operation.—[*Inrolled June*, 1851.]

To CHARLES PERLEY, *of the City of New York, in the United States of America, machinist, for certain new and useful improvements in the construction of capstans for nautical and general purposes.*—[Sealed 31st July, 1851.]

THESE improvements in capstans consist, firstly, in a novel arrangement of mechanism for giving rotary motion to a capstan through the agency of levers; and, secondly, in a novel mode of protecting the internal parts of the work from the weather, and affording a convenient means of lubricating them.

In Plate II., fig. 1, is an elevation, and fig. 2, a vertical section of a capstan constructed according to this invention. A, is the deck of a ship, or may be a platform, on which the capstan is to be mounted and used. *a*, is a base-flange, held down by bolts I, and raised slightly from the deck, and kept from straining the bolts or turning, by lugs, let partly into

the deck. This flange *a*, is made in one piece with the short base-cylinder *b*, and arms *c*, that connect it to the nave or hub 2. The nave 2, has a wrought band 3, shrunk on its upper end, to prevent it from splitting; and it receives the main spindle *d*, which is secured to it by a key 4. On the side of the nave, between the arms, there are bearings *e*; and at 5, there are bearings in the base-cylinder *b*. These bearings receive two shafts 6, on each of which, inside the base, is fixed a mitre or bevil-pinion *f*; and, on the end of each shaft, outside the base, is a disc-wheel *g*, formed as a female ratchet-wheel, with inside teeth 7, cut nearly at an angle of 45° with the radial line from the centre to the top of each tooth. Outside the wheel *g*, there is a disc *h*, which can rotate upon the shaft 6, but is retained thereon by inserting a pin *i*, through the shaft at its end; the disc has, on the inside face, two pin-joints 8, each carrying a pawle 9; which pawles are set in reverse to each other; so that, when turned in one direction, one pawle is out of action and the other takes into the teeth 7; and *vice versâ*, as shewn by dotted lines in fig. 1: thus, whichever way the disc *h*, is turned by the handspike *l*, (inserted in the eyes *k*, of the disc), one pawle is in action to rotate the wheel and ratchet *g*, in the direction in which the lever *l*, is moved.

Above the base *b*, is the capstan-barrel F, of hollow metal, having lugs 10, and bolts 11, that connect the barrel to the upper side of the bevil or mitre-wheel *m*, which gears into the pinion *f*; and the wheel is further sustained by lugs 12, that connect the lower inner bevil of the barrel to the outer and upper edge of the wheel; at the centre of which, a brass bearing *x*, is fitted around the spindle *d*. Within the upper part of the barrel F, is a hub, with arms *n*, forming a bearing near the upper end of the spindle *d*; on which arms *n*, a yoke *o*, is secured by bolts 13, and is fitted with an inverted seat, to take the pivot-formed head *p*, of the spindle *d*, so as to support the weight of the barrel F; and a pin 14, passed through the shaft *d*, keeps the barrel from rising. Over the centre of the pivot *p*, the yoke *o*, is provided with an oil-cup *q*, by which the pivot is lubricated. G, is the drum-head or cover of the capstan, held on by pins 15, or other convenient means, and formed with a hole *r*, to let oil into the cup *q*. The oil passing through between the pivot and seat runs down the spindle (lubricating the bearings) to a ring-cup, made in the top of the hub 2; and, from this cup, the oil runs through small grooves in the band 3, to the bearings *e*.

At H, is an annular ratchet-bed, having a descending flange

17, secured by bolts to the base *b*. In the upper face of the bed H, are ratchet-teeth, having both sides formed to an angle of about 20°, with a mortice or cell between them to receive the moving ends of the barrel-pawles *v*; and small holes are bored through the flange H, to allow water to run out of the cells. The barrel F, may be fitted with whelps, if desired.

The upper part I, of the capstan barrel is made nearly the same as usual, with holes *w*, to receive the handspikes or levers *l*, that are used in the eyes *k*; so that whenever small power and quick motion are needed, the handspikes *l*, may be applied to the drum-head I, if there is room to use them,—thus combining the ordinary construction of capstans with convenient means for enabling the capstan at once to operate as a powerful vertical windlass. When the levers *l*, are inserted in the eyes *k*, and are moved in the direction of the arrow, fig. 1, the pawles 9, of the discs *h*, taking into the teeth 7, turn the discs *g*, and mitre-wheels *f*, and *m*, with the barrel F, all in the same direction,—the pawles *v*, taking into the ratchet-teeth, and preventing the barrel from running back.

A given number of men at the levers *l*, will, by these means, be enabled to do a greater amount of work than they can do by using the common capstan-bars, inserted into the sockets in the drum-head of the capstan, with the men walking round the capstan pushing at the bars; as it is a downward pressure instead of a horizontal push.

This capstan can be put in any place where the men can stand round and close to it, instead of requiring a circle of many feet in diameter to walk round with the capstan-bars; whereas, in the present mode of working capstans, they frequently interfere with the conveniences of having hatchways and skylights where wanted; and, in addition to this, the seamen work with more safety, and, consequently, more confidence, when alongside this capstan, on a wet slippery deck, than when travelling round a capstan with bars fitted in the ordinary manner. A great advantage of this mode of construction is, that the whole of the parts are enclosed, and protected from wet, and are not in the way of ropes or the men; and, by the patentee's mode of constructing the eyes *k*, on the disc *h*, the disc is balanced, so as not to hang on one side, and rub on the shaft 6. One, two, or more similar shafts, pinions, and discs, may be used round the capstan.

The patentee claims, as his invention, the construction and arrangement of the cylinder, hub, and spindle, to receive the

capstan-barrel, with its bevil-wheel, taking into one or more bevil-pinions, on shafts supported and working on the cylinder *b*; and, in combination with the foregoing parts, he claims the application of the double-acting pawles, as described and shewn; he claims also the mode of constructing the disc *h*, with the eyes to receive the handspikes, for the purposes hereinbefore described.—[*Inrolled January*, 1852.]

To ALFRED VINCENT NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the carbonization of coal, and in the utilization of the products disengaged during that operation; in improving the quality of the products intended for illuminating purposes; and in regulating the flow of the same,—being a communication.* —[Sealed 27th May, 1851.]

THE objects of the present invention (which embraces certain improvements upon the invention patented by Messrs. Pauwels and Dubochet, 23rd April, 1850, and described at p. 425, of Vol. XL.) are, first, to extract gas from coal, and, at the same operation, to produce a quality of coke suitable for smelting metals and generating steam in locomotives, and to prevent, to a certain extent, the formation of bituminous oils during the process of distillation, and, by that means, to increase the illuminating power of the gas produced. Second, to regulate the flow of gas in pipes laid underground, or to supply gas to the consumer at a more equable pressure. The patentee only describes two arrangements of apparatus for carrying out the first part of this invention; but he does not confine himself thereto, as various modifications and analogous arrangements may be employed without departing from the nature and object of this invention.

The first apparatus is represented in Plate II.,—fig. 1, being a vertical section thereof, and fig. 2, a section taken on the line 1, 2, of fig. 1. It may be made to work either with or without a gas-extractor, according to whether it be desired to collect the gas for illuminating purposes, or to employ it as fuel in the carbonization of the coal. The distinctive characteristics of this apparatus are, to allow of the coal being operated upon and the coke discharged in large masses,—to cool the coke without the contact either of air or water,—to work continuously; that is, without stopping to discharge and re-charge the apparatus (the discharge of the coke being

nearly simultaneous with the introduction of a fresh charge of coal),—to obtain gas carburetted to a greater degree than is ordinarily produced,—to maintain the apparatus at a higher temperature, by reason of the simultaneous charging and discharging,—to apply a portion of the gas as fuel to effect the distillation of the coal,—and, lastly, to cause the caloric to circulate in such a manner as to utilize it as completely as possible.

The conditions necessary for obtaining these results are, first, that there should be two chambers placed contiguous to each other, in such manner that the first chamber may easily discharge its contents into the second, almost instantaneously, in a lump, and without the necessity of employing the manual labor required in the apparatus in ordinary use; second, that the caloric be caused to circulate by means of a peculiar arrangement of channels or flues. This apparatus is provided with one or more fire-places or furnaces; and, by means of a suitable arrangement of registers, the products of combustion of one or more fire-places, may, before proceeding to the chimney, be conducted successively or simultaneously to any number of apparatus. Near the fire-place or fire-places is placed the chamber in which the distillation of the coal is effected, and which is therefore called the "distilling chamber." This chamber has an opening at top for the reception of the charge; it is surrounded by flues for the circulation of caloric; and it is curved longitudinally to the degree necessary for the reception of the charge of coal, and its discharge when converted into coke. The curve must have the same radius at all points, in order that the mass of coke may be discharged freely without injury; and it should have a greater inclination at its upper than its lower part: this inclination might even assume a vertical position. The same holds good with the second chamber, which will be described under the name of the "cooling chamber." It is situated at the lower extremity of the distilling chamber, and is intended to receive the coke therefrom and cool it. These two chambers communicate by means of doors or covers, which are opened and closed by means of a crane, or any other suitable mechanical contrivance. The cooling chamber is supplied with air by means of flues outside, and has a door at its lower extremity through which the coke is extracted.

In the representation of the apparatus at fig. 1, *a*, is the fire-place; *b*, is the ash-pan; *c*, the distilling chamber; *d*, the cover that closes the upper opening of the chamber; and *e*, is the stopper or door for closing the lower opening of the distilling chamber. *f*, is the cooling chamber; *g*, is the cover

for the upper orifice of the chamber; g^1, is a frame, mounted on the inclined plane, and furnished with a trap g^2; and *h*, is the cover for the lower opening of the cooling chamber. *i*, is the dome or top of the furnace; i^1, dome for the distribution of caloric; i^2, flues for the circulation of caloric; i^3, flues for the escape of the caloric and incombustible vapours; *j*, horizontal flue; and *k*, *k*, are channels for ventilating the cooling chamber. *l*, is the chimney for the extraction of the gas, connected by pipes, l^1, with an hydraulic key or valve, upon the hydraulic main *n*, shewn detached in the enlarged sectional view fig. 3; *o*, is a chimney (provided with a cover o^1,) for conducting the gas to the fire-place, or direct to the chimney *j*; and *p*, is a pipe for connecting the chimneys *l*, and *o*. *q*, is an upper railway, on which a tilt-waggon q^1, travels; and q^2, is a lower railway, on which runs a moveable crane q^3, having a counter-weight q^4, and provided with chains q^5, for the purpose of opening and closing the apertures by raising or lowering the covers *e*, *g*. The distilling chamber *c*, is heated by the fire-place *a*, and is charged with coal by means of the tilt-waggon *q*. Before feeding-in the coal, the lower opening is closed by the cover *e*. The gaseous products pass off through the chimney *l*, and the pipes l^1, to the hydraulic main *n*.

When the coal contained in the distilling chamber has been converted into coke, the incandescent mass is transferred entire to the cooling chamber *f*. For this purpose, the lower cover *e*, of the distilling chamber, and the upper cover *g*, of the cooling chamber, are simultaneously removed by means of the draw-chains q^5, connected with the moveable crane q^3, and the mass descends by its own weight from one chamber to the other: the covers are then replaced, and properly luted. In order to facilitate this latter operation, the inclined bed g^2, between the two covers, is lowered; and this space remains open until the luting is removed. When several apparatus are set up contiguous to each other, the products of combustion may be caused to pass from one to the other through the flues i^3.

The gases not suited for illuminating purposes may, after each operation, be conducted to the furnace *a*, through the flues i^3. Should it not be required to use any of the gases for illumination, they may be employed as fuel to aid in the carbonization of the coal. The air necessary for the combustion of the gas is introduced through flues adapted for that purpose; and, in this case, the fire-place *a*, is made smaller, as it is fed only with refuse fuel.

It is necessary, when charging or discharging the distilling

chamber, to shut it off from the action of the gas-extractor, in order to avoid any admixture of air with the gas. This is effected by means of the apparatus represented in the enlarged sectional view fig. 3. *n*, is the hydraulic main; *r*, is a pipe for the entrance of the gas, connected by the pipes l^1, with the chimney *l*; *s*, is a cylinder in which the plunger *m*, works,—its lower end being made to dip into the water in the hydraulic main, and thus form a water-joint; and s^1, are pipes concentric with the plunger. The plunger is connected to the rod s^2, which works through a stuffing-box in the top of the cylinder *s*, and through guides s^3; and it is provided with stop-pieces s^4, by which its length of stroke may be determined. In order to arrest the flow of the gas it is only requisite to lower the plunger into the liquid. This apparatus may also be applied to an extractor as an hydraulic valve.

The second arrangement of apparatus is represented, in vertical section, at fig. 4. The principal points of difference between this arrangement and that shewn at fig. 1, are, first, that the cooling chamber is dispensed with; secondly, there is a difference in the form, arrangement, and nature of the materials constituting the distilling apparatus; and, thirdly, the gas is obtained without the help of an extractor. In this arrangement also the distilling-chamber is curved, and the gaseous products of distillation pass off by the pipe *i*. *a*, is the fire-place; *b*, the ash-pit; *c*, a curved retort, constructed either of cast-iron or clay; *d*, the cover of the upper or feed-opening; *e*, the cover of the lower or discharge opening; *f*, are flues for the circulation of caloric; *h*, horizontal flue; *i*, pipe for the extraction of the gas; *j*, plunger-rod; *k*, plunger; *l*, hydraulic main; *m*, railway; and *n*, tilt waggon.

The second part of the invention relates to a means of regulating the flow of gas, and may be adapted either to pipes running under ground or at the houses of consumers. The regulator to be applied to service-mains or pipes running under ground is an improvement upon the moderator described in the specification of Pauwels and Dubochet before alluded to. It consists, firstly, of a valve, whereby the section of the aperture for the flow of the gas may be determined or regulated; secondly, a float, for giving motion to the mechanism, and which is operated by the action of the gas; thirdly, a counter-weight, for regulating the minimum degree of pressure, under the influence of which the gas is to flow; fourthly, a second weight, for determining or regulating the pressure of the gas; and, fifthly, a metal casing, enclosing the whole, so as to form one piece with the pipe. This regu-

lator is represented, in vertical section, at fig. 5. *a*, is the entrance-pipe for the gas; *b*, exit-pipe for the same; *c*, the cover; *d*, the casing for the valve; d^1, d^1, guide-pieces; *e*, the float or bell, suspended from the beam *f*, by a flexible rod *g*; *h*, the regulating valve, mounted on a valve-rod *i*, connected by the rod i^1, to the beam *f*; *j*, pipe leading to the atmosphere; *k*, a water-tank; *l*, bearing for the beam; *m*, chamber occupied by gas; *n*, minimum counter-weight; *o*, rod, by which this weight is suspended; and *s*, cheeks of the case *d*.

The parts above referred to are similar to those of the moderator in the above-mentioned specification, and act in the same manner. The apparatus, thus constituted, gives out the gas at a determinate pressure; but this pressure becomes modified on passing through the service-pipes, in proportion to their size and the speed at which the gas is flowing,—the latter necessarily varying, according to the consumption. The apparatus should therefore, in order to perform effectually, give out the gas at a pressure proportioned to the consumption, and at progressive degrees, in a ratio corresponding to the speed at which the gas is flowing. This result is obtained by means of the progressive weight n^1, which is mounted upon the rod l^1, and admits of the increase of pressure, under which the gas is to flow, being determined at pleasure by changing its position on the rod l^1. The effect of this arrangement is to increase the action of the minimum counter-weight *n*, in proportion to the inclination of the beam,—the play of which displaces the centre of gravity of the progressive counter-weight n^1.

A form of regulator, more especially intended for the use of consumers, is represented, in vertical section, at fig. 6, and in horizontal section at fig. 7. *a*, is the entrance-pipe for the gas; *b*, the exit-pipe; *c*, the cover; *d*, a horizontal partition, formed with an opening, in which the valve *h*, works; *e*, the bell or float, attached to the lower part of the valve; *f*, the beam, having a segmental arm at one end, from which the valve *h*, is suspended by a steel suspension-rod f^1, and furnished at the other end with a counter-weight f^2; and *g*, is a vertical or inclined rod, mounted on the shaft of the beam *f*, and provided with a progressive counter-weight g^1. The lower part *k*, of the apparatus is a receiver (fed by the pipe *j*,) for the products of condensation, and also for receiving any superfluous water which may be contained in the receiver k^1, through the syphon-pipe j^1; and at the lower part of the receiver *k*, is a screw-plug *p*, (fig. 3,) for drawing off the water. The opening *r*, is furnished with a pipe, called a

safety-pipe, communicating with the outside of the house. Its object is to allow the introduction or expulsion of air into or from the bell-float *e*, according to its upward or downward movement; and also, in case there should be a lack of water in the apparatus, and, consequently, danger of gas entering the pipe *j*, to carry it off from the dwelling, and by that means avoid any danger. The tank or receiver k^1, is filled with water as high as the upper orifice of the pipe j^1, by means of the supply-pipe *t*.

The weight f^2, is intended to form an equilibrium to the different parts attached to the beam *f*, and also to determine the minimum pressure under the influence of which the gas is compressed in the chamber k^1. The counter-weight g^1, is intended, according to the position of the beam, to increase or diminish the value of the weight f^2, and to modify the progressive pressure under the influence of which the gas is required to flow. The fixed and minimum or progressive degree of pressure may be obtained, within any desired limits, by bringing either of the weights nearer to, or further from, the shaft of the beam, or other analogous part. For this purpose, the weights are made adjustable either on the end of the beam or on the rod *g*; or the same result may be obtained with a single weight, by adjusting it in such a manner that its movement shall displace it from its centre of gravity. In the example above given, it will be observed, that the beam, in its longitudinal extent, describes an angle which may be infinitely varied and produce the same result. This is the same, also, with regard to the position of the rod *g*, as respects the beam; as the means indicated consist in changing, by the play of the beam, the centre of gravity of the counter-weight or counter-weights g^1, and f^2. The piece *s*, is intended to limit the course of the beam *f*, by adapting two stop-rods thereto. *i*, is a small shaft, passing to the outside of the apparatus through the stuffing-box i^3, and worked by the crank i^4. In the middle of this shaft is a fork i^1, which is capable of being brought into contact with the spindle i^2, affixed to the beam. The object of this arrangement is, by the rotary movement of the shaft, to bring the fork i^1, beneath the spindle i^2, so as to raise that end of the beam, and, with it, the valve, and allow the free passage of the gas. The gas enters the upper chamber *m*, through the pipe *a*; thence it passes by the valve-way to the chamber k^1; and from this chamber it makes its escape through the pipe *b*. The opening of the valve is dependent upon the movement of the beam, and the influence of the counter-weight or counter-weights, the

action of which is to raise the float *e*; and, consequently, the gas contained in the chamber k^1, is submitted to a given pressure, under which it flows out. Should this pressure tend to diminish, the float will, by rising, open the valve, and allow an increased quantity of gas to pass; but if, on the contrary, the consumption of the gas is less than the supply through the valve *h*, the pressure, by increasing above the float, will cause the valve to descend, and diminish the area of the exit-aperture for the passage of the gas. The greater the extent to which the valve is open, the greater will be the pressure of the gas above the float; as the beam, by its movement, increases the relative power of the counter-weight or counter-weights, by displacing the centre of gravity of these latter,—which arrangement allows of the application of progressive pressure to the flow of gas.

The patentee claims, as regards the apparatus represented by figs. 1, 2, 3, and 4, First,—the arrangement of the distilling chamber or coke-oven, with or without the stationary cooling chamber, in combination with the furnace or furnaces, and flues or channels, for the distribution and transmission of caloric from one apparatus to the other. Secondly,—constructing upon a curve the chamber in which the operation of distillation or carbonization is effected: which curved chamber is placed at the degree of inclination most favorable to the feeding-in of the coal and discharging of the coke. Thirdly,—placing or arranging the cooling chamber in such a manner that it may form a continuation of the distilling chamber. Fourthly,—the mechanical arrangements and apparatus by means of which the coal is fed into the distilling chamber; together with the other arrangements by means of which the distilling and cooling chambers are put in communication, in order to allow the charge to pass from one chamber to the other when the coal has been converted into coke. Fifthly,—The general arrangement of the apparatus, which enables the coal to be operated upon in such masses as to obtain coke of greater density than at present. Sixthly,—the railway and moveable crane, placed upon the inclined plane, for the purpose of working the moveable covers of the distilling and cooling chambers. Seventhly,—the arrangement by means of which the gas may be collected for illuminating purposes, or wholly or partially applied to heating apparatus.

With regard to the regulating apparatus, he claims the peculiar construction and arrangement of the same, for the purpose of regulating the flow and distribution of the gas to consumers, as above shewn and described; and particularly

the use of the arm g, and progressive weight g^1, in fig. 6, and the arm and weight l^1, and n^1, in fig. 5.—[*Inrolled November*, 1851.]

To ROBERT COGAN, *of Leicester-square, in the county of Middlesex, glass merchant, for improvements in the application of plain or ornamental glass, alone or in combination with other suitable materials, to new and useful purposes of construction or manufacture.*—[Sealed 16th January, 1851.]

THIS invention relates, first, to an improved mode of constructing and arranging parts of a metal or wooden framing with glass panels, so that a portable or removable verandah or balcony may be made thereof;—which, when differently arranged, may also be used as a show-front for the display of goods, or as a window-garden or green-house; and the same parts may also be so arranged and combined as to form a portable pavilion or tent, and for other purposes for which the framing and glass panels may be found applicable. These framings, as applied to a window, and arranged or connected together, so as to form a window-garden, or small green-house or fern-house, or an enclosed balcony or verandah, are shewn in vertical section at fig. 1, Plate II., and in front elevation at fig. 2. The whole structure is composed of separate wooden or metal frames *a, a*, in which are panels, made of white or colored glass, plain or cut, or otherwise ornamented. The frames are connected together by fastenings; and, in order to support them outside the window, there are horizontal levers or arms *b, b*, sustained from below by brackets, levers, or struts *c, c*. These parts are constructed, by preference, of iron; and the flooring may be laid and secured thereon in any convenient manner. The frames *a, a*, are furnished, at their lower ends, with pins or studs, which take into holes made in the horizontal levers or arms *b, b*; and the frames may, if required, be further connected together at the sides by hooks, sliding bolts, or other fastenings. The roof of the structure is composed of triangular-shaped frames *d, d*, which are also glazed, and meet at a point above, where they are secured in any convenient manner; and they are likewise furnished with pins or studs, which take into holes made in the upper ends of the frames *a, a*, and thereby support them in the standing position shewn. The frames *a, a*, are all of the same dimensions; and, if required, two or more sets may

be combined together, so as to form one long chamber, as shewn by dots in the plan view, fig. 3. To effect this it will only be necessary to bring forward the side frames into a line with the others; and then there will be a continuous front, with a lean-to roof, composed of the triangular frames *d, d.* It will be obvious, that by combinations of the rectangular side-frames *a, a,* and the triangular frames *d, d,* to form the roof, pavilions, tents, chambers, green-houses, and temporary constructions, of various kinds and dimensions, can be made, so as to stand by themselves, without the assistance of support from a side wall. Buildings or constructions can, in this manner, be erected with great facility, at moderate cost, and in a very short time; and, after having served one purpose, they can be quickly taken to pieces, removed to another spot, and converted into another form, for a different purpose. The rectangular side frames *a, a,* can also be combined together, so as to form a screen for a library or dining room; in which case it may be advisable to make use of opaque, or only semi-transparent, glass.

The second improvement relates to a novel construction of glass ventilator, to be applied to windows for ventilating apartments. Fig. 4, represents a transverse vertical section of the ventilator. It consists of an inclined frame *e,* which is glazed like a window-sash, and is adapted to the inside of the ordinary window-sash, where it is fixed in an inclined position. The sides and roof are also glazed,—leaving, however, a long opening or space *f,* along the top, to allow the vitiated air to escape from the room. A similar long slit or opening is made in the upper pane of the window, as at *g*; and one of the lower panes is removed altogether, as at *h.* The external air will therefore be freely admitted at *h,* and will ascend in the ventilator; while the vitiated air from the room will pass out through the openings *f,* and *g,* in the direction of the arrows.

The third improvement relates to a novel form or construction of striking or propagating glasses, and is shewn at fig. 5, which represents a section of one of the improved glasses. The improvement consists in adapting to the centre of the glass an inverted tube or hollow space, which receives the heat that is generated in the hot-house by the ordinary or any other convenient means, and communicates it in a more equable manner to the earth in the pan.

The fourth improvement consists in constructing churns of glass and other materials not liable to corrosion, instead of wood and metal. The barrel is made of glass, and the in-

ternal moving parts, such as the beaters, are all made of wood, or other material not liable to corrosion, as is the case with iron, brass, or other metal; and all the metal parts that are required for fitting and working the churn, are placed outside. Fig. 6, represents a vertical section of a churn, constructed according to this part of the invention. The glass barrel *a*, rests upon a wooden stand or base *b*; and on the inner side the glass barrel is made with a projecting point or centre *c*, to support the lower end of the vertical shaft of the rotary perforated dashers *d*. The dasher-shaft passes through the cap or cover *e*, of the churn, and carries, at its upper end, a bevilled pinion *f*, which gears into, and is driven by, a bevilled toothed wheel *g*, mounted on the horizontal shaft *h*. This shaft turns in bearings in a cross-piece *i*, on the top of the cap or cover *e*, and is provided with a winch or handle, whereby the dasher-shaft inside may be actuated. It will be seen, that the cap or cover *e*, is hollowed at the inner or under side thereof, for the purpose of allowing air to mix with the cream during the churning operation. The churn is also provided inside with a stationary frame, furnished with a number of vertical stationary dashers *j*; so that, as the cream is dashed or thrown about by the rotary dashers *d*, it may be thrown against the stationary dashers *j*, and the conversion of the cream into butter facilitated.

The fifth improvement relates to a mode of constructing glass candlesticks, whereby the hour of the night may be shewn by the burning of the candle. The improvement consists in making a tubular glass candlestick, and graduating the tubular part thereof from the bottom upwards; then, when the candle is placed in the tube, it will be pressed upward by a spring, in the same manner as in the well-known metal tubular candlesticks; and the lower end thereof will gradually rise as the upper part burns away; and, by means of the graduations on the tube, the time it has been burning will be correctly indicated.

The sixth improvement consists in making a glass moveable handle or stem for pens or pencils, which may also be employed as a case; so that pens and pencils may, without inconvenience or risk of injury, be carried in the pocket. This glass case will be found peculiarly useful for glass pens, which are made with a long glass tubular stem, terminating in a bulb or reservoir, with a very fine point. By adopting this improvement, the long glass stem, which is extremely liable to break, may be dispensed with; and, in place thereof, the tubular case, above mentioned, may be used as a handle,

into which the stem of the pen (which it is proposed to make much shorter than usual) may be inserted, as shewn at fig. 7, when required for use; but, when out of use, the pen can be reversed, and the point inserted in the tubular part of the handle, as shewn at fig. 8. The short stem of the pen should be ground to fit the tubular handle, and a flange or stop made on the stem to prevent it from going too far into the handle.

The seventh improvement consists in making dish-covers of glass. The patentee prefers to make the covers of an ovular form, but of different sizes. They may be made, either by blowing or moulding, of any pattern, and formed of either plain, or cut, or engraved glass, and colored or uncolored, according to fancy. These covers will be found useful for excluding dirt, flies, dust, or damp, from cold meat and edibles of all kinds, and other perishable articles; and they are much cleaner and more easily kept in order than the ordinary metal covers.

The next improvement consists in employing thick slabs of glass, and other masses of glass, to form monuments in commemoration of illustrious men and remarkable events. The glass is to be used in slabs or blocks, in a similar manner to that in which stone is now employed; and the surface of the glass may be either polished, or rough, or ornamented with any particular design, or part of a design, by casting, moulding, or pressing. As various elaborate forms or designs may be imparted to the glass by these well-known processes, a monument may, by the judicious employment of this material, be made highly ornamental, at a comparatively moderate expense. The patentee is aware that the panels of mural and other monuments have been made with sheet-glass, with some device painted on the back thereof. He does not, therefore, lay any claim to using sheet-glass for such a purpose, as his improvement differs essentially from this plan, inasmuch as he proposes to construct the whole, or, at any rate, the greater portion of a monument of blocks and thick slabs of glass, moulded to any particular design or pattern.

A very brilliant effect may be produced by combining blocks or slabs of plain polished glass in the form of a prism, placed on one end, so as to form a column; and, if required, the edges may be protected by a moulding of metal.

The patentee claims, First,—the novel application of glass to the various purposes above set forth, and for which purposes this material has not hitherto been employed. Second, —the improved mode of constructing portable show-fronts,

verandahs, green-houses, pavilions, tents, and other similar erections, as described and shewn at figs. 1, 2, and 3. Third,—the improved glass ventilator shewn and described, or any mere modification thereof. Fourth,—constructing striking or propagating glasses with a hollow space or inverted tube in the centre for receiving and communicating heat to the earth in the pan. Fifth,—the mode, above shewn and described, of applying glass, in combination with other materials, for making churns; and also the arrangement and construction of the various parts shewn and described. Sixth,—the use of tubular glass candlesticks, graduated on the outside for the purpose of indicating the hour. Seventh,—the application to pens and pencils of a hollow moveable glass case, which may be made to answer the purpose of a handle, as described. Lastly,—the method, above described, of constructing monuments of blocks or slabs of glass, which may be cast or moulded to any design or part of a design.—[*Inrolled July,* 1851.]

To Frederick Hale Thomson, *of Berners-street, in the county of Middlesex, Gent., and* George Foord, *of Wardour-street, in the same county, chemist, for improvements in bending and annealing glass.*—[Sealed 25th September, 1851.]

This invention consists in combining means and apparatus for bending and annealing sheets of glass, so as to obtain the same in concave forms, suitable for reflectors and other uses, according to the shape of the moulds employed.

The moulds used in carrying out this invention are made, by preference, of cast-iron, with a small hole or air-passage through the centre of each; and, on the under side, they are suitably formed to admit of being fixed upon an upright axis within the muffle or oven in which the glass to be bent is heated. The muffle or oven has a fire on each side externally, the heat and flame from which ascend and enter at the upper part of the muffle, by a long opening, extending from front to back, on either side thereof; so that the flame and heated products from the opposite fire-places meet in the middle of the arch or roof over the muffle, and pass off through openings in the arch or roof; and, by this means, the greatest heat will be at the upper part of the muffle. The door of the muffle has an opening or sight-hole in it, through which the workman can see when the glass is sufficiently heated.

Through a hole in the bottom of the muffle projects an upright axis, which is capable of rising and falling, and has a rotary motion given to it by suitable gearing.

The operation of bending and annealing the sheets of glass is as follows:—The workman places on the upright axis, within the muffle, a mould of the proper shape and size for the circular sheet of glass to be bent; so soon as the mould has become heated to such an extent as would cause it to present a slightly-red appearance in the dark, he removes it from the muffle, and places the circular sheet of glass just within the upper part of the mould; and then he replaces the mould upon the upright axis, which is at this time to be at its lowest position, in order that the sheet of glass may be subjected at first to the lowest degree of heat. The axis is kept constantly rotating, and is raised by degrees, so as to bring the upper part of the mould and the sheet of glass nearer the top of the muffle; and, when the workman sees that the glass has arrived at the bending heat, he presses upon it a convex surface or piece of cork or soft wood (previously dipped into water), fixed at the end of a handle; whereby, as the axis rotates, the glass is pressed into and caused to assume the form of the interior of the mould. The mould and glass are now removed from the muffle, and another mould introduced to be heated, in order that a fresh sheet of glass may be operated upon. The hot mould, containing the bent sheet of glass, is to be covered, when taken from the muffle, with a cover of sheet-metal; and the bent glass is to be allowed to cool down with the mould: whereby it will be partially annealed. The annealing is completed by placing a number of such bent sheets of glass in an annealing muffle, wherein the glass is heated and cooled down in a suitable manner for effecting that object.

The patentees claim, as their invention, the combination of means and apparatus above described for bending and annealing glass.—[*Inrolled March,* 1852.]

To Joseph Mansell, *of Red Lion-square, in the county of Middlesex, manufacturing fancy stationer, for improvements in ornamenting paper and other fabrics.*—[Sealed 31st July 1851.]

This invention consists in imparting to paper, and to fabrics capable of receiving a gloss by pressure between hard surfaces,

patterns or designs which will somewhat resemble the effect obtained by plain damask weaving.

In operating to produce the novel kind of ornamentation which the patentee terms "satin damask," he works either upon fabrics having naturally a dull surface, or such as have been prepared with a glossy surface,—the object being to display the pattern by giving it a glossy or dull surface, as the case may be, so as to contrast with the original ground or surface of the fabric ornamented.

In applying this invention to fabrics prepared with a glossy surface,—as, for instance, glazed calicoes, or paper having a satin finish, any required design is cut out in a thin plate or sheet of metal (after the manner of stencil-plate cutting); and such plate is placed upon the calico or other fabric that is to receive the pattern; and then a damp cloth or blanket is applied to the plate, so as to bring the cloth into contact with so much of the glossy surface as is left uncovered by the plate: by this means, the gloss on such exposed parts is destroyed, and thereby the required pattern is produced on the fabric;—the pattern in this case being dull, while the ground is glossy.

Another mode of producing the same effect on fabrics having a glossed surface, is by the use of blocks, similar to those employed by calico printers. To the printing surface of such blocks moisture is applied; and, while in a damp state, they are pressed upon the fabric to be ornamented, after the manner of block printing: by which means the gloss is removed from such parts of the fabric as have been brought into contact with the damp surface of the blocks, and a like effect to that before mentioned is produced.

In the modes above described for obtaining the satin-damask finish, two operations are requisite,—viz., first, the glazing or glossing of the fabric; and, second, the partial removal of the gloss; but the satin-damask finish may be obtained at one operation, by glossing the fabric in parts only, instead of over its whole surface, leaving the other parts corresponding to the pattern, or the spaces between the pattern, in their normal condition. In carrying out this mode of operating, a polished steel roller, turned perfectly true, or a polished steel plate, of suitable thickness (say, three-sixteenths of an inch), is prepared; and, upon this polished steel surface, any required design is drawn, in common stopping-out varnish, or, in fact, in any substance that will resist the action of dilute acid. When the surface of the roller or plate is covered with the design to the extent required, the exposed parts of the po-

lished surface are subjected to the corroding action of dilute nitric or other suitable acid; and, by that means, the character of the surface of the exposed part of the roller or plate is changed, by removing the polish therefrom. As soon as this change has taken place—the time for effecting which will vary according to the strength of the acid used, the temperature of the atmosphere, and other causes—the acid is thrown off, and the roller or plate washed with water; and then the stopping-out varnish is removed,—leaving an ornamented surface, still smooth to the hand, but presenting to the eye the marked difference of dead and burnished metal. If it is a roller which has been thus prepared, it is mounted in a suitable framing; and over it a perfectly smooth pressing-roller, made, by preference, of some slightly yielding material, is placed. Between these rollers, the paper or other fabric to be ornamented is passed (driving the steel roller by manual or other power); and thereby a glazed pattern is produced on the fabric, corresponding to the bright surface of the metal roller.

In using a plate prepared as above described, it is passed, together with the fabric to be ornamented, between a pair of pressing-rollers; and thereby a counterpart of the pattern contained on the plate is obtained on the fabric.

The patentee claims, First,—producing upon the class of fabrics already designated, ornamental designs or patterns, by partially removing the glaze or gloss which such fabrics have received; and Secondly,—partially glazing or glossing paper, and other fabrics that are capable of receiving a gloss, by pressure, so as to produce ornamental designs or patterns, by contrast of the dull and glazed parts of the surface of fabrics so treated.—[*Inrolled January,* 1852.]

To Levi Bissell, *of the city, county, and State of New-York, in the United States of America, engineer, for improvements in the means of sustaining travelling carriages and other vehicles; which improvements are applicable to other like purposes.*—[Sealed 5th August, 1851.]

This invention refers to a novel construction of springs, applicable to carriages used on railways and other roads, and also to a variety of useful purposes where elastic resistance is required. In Plate II., fig. 1, represents a piece of wood prepared to be formed into a spring; fig. 2, shews the wood formed into a bow-spring; fig. 3, shews a combination of

wood and metal ready to be curved into a bow-spring like that exhibited at fig. 4; fig. 5, is a side elevation of an elliptic spring, one side of which is formed of wood, and the other side of wood and metal combined; and fig. 6, is a side view of similar springs, but in the shape of a lever.

These springs may be made of any wood fit for the purpose, dressed to a proper size, and of such a taper towards each end (see *a*, fig. 1,) that, when pressed upon, they will yield as required. Along the whole length of the spring, saw-cuts 1, 1, are made, from about half an inch to two inches apart, according to the quality of spring required. These cuts are made only so far through the wood as may be needful to adapt the material to the intended use, and they are filled with strips of metal, wood, or other hard substance, 2, (see fig. 2,) when a rigid spring is required; or with some elastic substance for a more yielding spring. These strips of filling substance are forced sufficiently tight into the saw-cuts to make the spring retain its required curve when sustaining the desired load. In some cases, where a great weight is to be borne, rivets 3, 3, are passed through each block thus formed, to prevent the blocks from splitting off from the main body of the spring; and to prevent the strips or filling-pieces 2, from dropping or working out, if, by any means, they should become loose, a corner of the washers on the ends of the rivets may be made to extend a little over the inserted piece.

When the spring is required to sustain a very heavy pressure, it may be necessary to strengthen it, by bolting a plate of steel, or other metal, of the length of the spring, on the concave side thereof, as represented at figs. 3, 4, 5, and 6. This mode of constructing springs is shewn at fig. 3, where a plate *b*, of steel, or other metal, is attached to a tapering piece of wood *c*, of suitable quality, by bolts 3; and the ends of this plate of metal are turned over the ends of the wood, and secured by bolts. The saw-cuts 5, are made across the wood, down to the metal plate in the spaces between the bolts 3; and these saw-cuts are to be filled with any proper substance, to give the spring its required shape, as shewn at fig. 4. Instead of filling in the saw-cuts, a plate of metal may be made in the shape of the required spring; and blocks of wood, with the ends setting close against each other, may be bolted on; and thereby the same effect will be produced.

Fig. 5, represents an elliptic spring, with one side formed as shewn at fig. 2, and the other side as shewn at fig. 4,—the ends being jointed together, as in the ordinary construc-

tion of springs; but, if desired, both sides may be constructed alike, either with or without the metal plate. Fig. 6, shews a double lever-spring, similar to those used under a carriage-body,—one lever being formed with a metal plate, and the other without a metal plate; but these may be both alike, either with or without the metal plate; and springs of this form may be applied to any use desired.

The operation of a weight on the end or ends of a spring, thus formed, is to force the fibres of the wood together, endwise, on one side; while, on the concave side, the metal plate, or the wood, takes a tension which merely acts to pull the fibres apart; and no weight short of that which would be sufficient to pull these apart, or to crush the ends of the wood, will destroy the spring; although the yielding and elasticity of the spring is entirely according to the force with which the blocks are forced together,—the elasticity being obtained by the compression of the fibres endwise, or by the yielding nature of the material filling the saw-cuts. As springs of this construction may be applied with advantage to other uses than for carriages, the patentee intends to apply them to any other purpose for which they may be found available—as between the arms and paddle-plates of paddle-wheels; or to any other use in which a regulated or regulatable elasticity may be needed, under a constant or varying pressure.

The patentee claims, as his invention, the constructing of springs for sustaining pressure, either of wood alone, or of wood and metal, or other elastic or non-elastic substance or substances, combined as above set forth.—[*Inrolled February,* 1852.]

To William Newton, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for certain improvements in the manufacture of cords, ropes, bands, strong cloths, quiltings, sacks, and cushions, in which manufacture caoutchouc forms an essential ingredient; and in the application of parts of these improvements to the manufacture of pads, stoppers, tubes, boxes, baskets, coverings, wrappers, and other like articles of utility,—being a communication.*—[Sealed 8th June, 1850.]

The first part of this invention relates to the application of caoutchouc, or India-rubber, to the making of various articles of manufacture and wares,—such as hose, hat-boxes, gun-

cases, baskets, tumblers, vases, mats, hollow chamber and kitchen ware, covers for the protection of glass and other bottles, tow-lines or ropes, coal-scuttles, and a variety of other articles, but particularly such as are formed in or on moulds. It consists in making such articles of cords of metallic India-rubber, by winding or laying such cords into the form required whilst the rubber is in a green or uncured state; so that, by reason of the adhesive qualities of the metallic rubber in that state, the several windings, layings, or crampings of the various parts of the cord against or upon one another, may adhere, and thence become thoroughly united on subjecting the whole to the curing process.

The cords may be made of "India-rubber vellum," prepared in the following manner:—The operator takes a sheet of prepared India-rubber, such as is used in making metallic or vulcanized India-rubber, but before it has been cured by heat, and of about the thickness of the intended fabric; and he rolls it on to a beam, with a sheet of cotton or other cloth interposed, to prevent the surfaces of the rubber from adhering. The beam thus prepared is placed on appropriate bearings, near the usual calendering rollers. A thin fleece or bat of cotton, or other fibrous substance, is, in like manner, rolled upon a beam, and also mounted near the calendering rollers. One end of the sheet of India-rubber, without the cloth, and one end of the fleece or bat of fibres, are put together in the bite of the calendering rollers, and thus rolled through;—the rollers being so adjusted as to press and force the fibres of the bat or fleece into the sheet of India-rubber, or so much of them as the India-rubber will receive; and the surplus, if any, is then to be stripped or rubbed off; or, instead of this, the sheets may be made according to the improved, process, hereafter described, for making strong cloths.

For making the cords, it is preferred to cut or form the sheets into strips of the required or any desired length and breadth, and then roll them up, in the green state, to form the required diameter of cord; but, instead of this, the sheets of vellum may be made of a thickness about equal to the intended diameter of cord, and then passed between grooved calendering rollers, to cut each sheet into a series of cords of the intended diameter; or, for very large work, requiring great strength and size—such as engine-hose, tow-lines or ropes, tubes, baskets, coal-scuttles, &c.—the sheets of India-rubber vellum are wound on to hempen or other cords, of the required size, so that the vellum shall adhere to such cords, and effectually protect them, and present an adhesive surface for the union of the various parts of the intended fabric.

When thus prepared, and still in the green state, the cords are worked either in or over a mould or pattern, so that the parts of the cord in the various windings shall come together or touch and adhere, by virtue of the tacky quality of the metallic rubber in the green state. As, for instance, to make engine-hose, the cord is wound, in the form of a helix, upon a mandril,—the contiguous turns being well pressed together, to insure their union along the entire line of the helix; and it is then put into an oven, and heated to the required temperature to cure the India-rubber: whereby the tackiness is removed, and, at the same time, the junctions of the several windings are rendered strong, permanent, and waterproof. After this, the mandril on which the cord was wound is removed, and the hose is completed. In this way, articles of a variety of forms, which will admit of moulding in or on a single or divided mould, can be produced by winding either over or within the mould. The thickness can be increased at pleasure, either by using cords of greater diameter, or by two or more windings one over the other,—the various windings adhering to one another.

For tow-lines, or other ropes, India-rubber vellum cords may be wound on to a cord or rope composed of hemp or other like substance, or of metal wire. In this case, the winding of the India-rubber cords will not only adhere to one another, but to the inner cord or rope, unless such inner cord or rope be made of metal. In making baskets, vases, or other articles of like kind, the cords, instead of being wound close together, inside of or over a mould, may be applied so as to form various open figures, and crossed, to form the connection, and tie the whole together. For making mats, and other flat work, the method of procedure last described may be followed, except that the laying of the cords is to be done on a flat surface; but such articles may also be made by coiling the cords in volutes, commencing at the centre; or the cords may be coiled around a centre piece, made of any form desired.

The patentee states, that, although he has thus described the mode of operation for the production of various articles of cords of India-rubber vellum, he does not wish to confine himself to the application of this material (in the manner described above) to the objects enumerated; as the same is equally applicable to other articles of like character. He claims, under the head of India-rubber cord fabrics, the making of the various articles above enumerated, as well as other like or similar articles, by winding, or connecting to-

gether, cords of India-rubber vellum in the green state, and then submitting the same to the process of curing, to secure the union of the various parts,—the whole being effected in the manner substantially as described.

The second part of the invention consists in making cellular India-rubber cloth, by uniting, at intermediate places, two sheets of prepared India-rubber vellum, tissue, or vegetable leather, or other fabric made of India-rubber, compounded or united to or with fibrous substances, by interposing some non-adhesive substance or substances, where the two sheets are not to be united, to form the cells: which cells may be filled with water, or other liquid, or with atmospheric air or other gas; or filled in with some elastic, yielding, or buoyant substance or substances, such as carded cotton, horse-hair, cork, &c.;—such elastic substance or substances, in the latter case, being used as the substitute for the non-adhesive substance used to form the cells.

The method of procedure for the production of the aforesaid fabric is as follows:—The operator takes two sheets of India-rubber vellum, tissue, or vegetable leather, or other like India-rubber fabric, whilst they are in the green tacky state, and will adhere together; and, on one of the sheets, he lays, at proper intervals (according to the figure required to be produced), double pieces of India-rubber vellum, cut to any desired form,—taking care to put together the two surfaces of the pieces of the said vellum which are inadhesive. He then places on the top of this the other sheet of prepared India-rubber vellum, &c., and passes the whole betweeen two rollers (one or both of which are covered with some elastic substance), such as are used for making shirred India-rubber fabrics. By this means, the two sheets of prepared India-rubber are united to each other along the spaces not occupied by the interposed pieces of India-rubber vellum; and they are also united to the outer surface of such pieces of vellum; but as the surfaces of the interposed pieces of vellum which come together are covered with fibres of cotton, they will not be caused to adhere by the pressure; and hence such spaces will form cells, into which water, or other liquid, or atmospheric air, can be forced to inflate, fill, or distend the cells. After the sheets have been thus prepared and united, they may, if desired, be submitted to artificial heat, or any other curing process.

The India-rubber vellum used for the interposed pieces, is formed by laying on to one surface of a sheet of prepared India-rubber, a bat of carded cotton, or other fibrous sub-

stance, and, by the application of pressure, forcing the fibres of the bat into the sheet of rubber, and then removing the surplus fibres. By this means, an article is produced, which, before curing, has one face adhesive, and the other non-adhesive.

In making this new fabric, care should be taken so to form the interposed pieces as that all the cells shall communicate with one place, to which is to be applied an inflating tube, or a valve, through which water or other liquid, or air or other gas, is to be introduced; or the cells may be arranged in series, and each series made to communicate with one distending or inflating tube or valve. This latter will be preferable when the cellular fabric is to be used for the production of life-preservers. When the cells are to be filled with some elastic or light substance or substances, as a substitute for water, air, or gas, then, on one of the sheets of India-rubber, is placed a thick bat of carded fibrous substance or substances, or horse-hair, or cork, or any other light or elastic substance, so cut or formed as to leave portions of the surface of the sheet of India-rubber vellum, &c., uncovered by it; the whole is then covered with the other sheet of prepared India-rubber vellum, &c.; and those parts of the surfaces of the two sheets between which there is no interposed substance or substances, are brought together by pressure, so as to cause them to adhere; after which, the whole is, if desired, submitted to the curing process. When the interposed substance is not very thick, the two sheets of vellum, &c., can be brought together, to cause them to adhere, by passing the whole between two elastic rollers, as before described.

For all articles, such as beds, cushions, &c., which require to be ventilated, the fabric, prepared as above described, may be perforated or rendered porous where the two sheets are united, that is, between the cells, for the free passage of air.

The patentee does not limit himself, in either of the two examples above given, to the kind of substance interposed between the sheets of India-rubber; as other substances may be substituted for those described. For instance, in the first example, for making the fabric with air cells, instead of using India-rubber vellum, two thicknesses of cloth or paper, or a single thickness of some substance which will not adhere to the sheets of India-rubber in the green state, may be used.

Under the second example,—if the fabric is to be used as a float, the cells may be formed by the interposition of any light or buoyant substance; and if for a bed or other article

requiring elasticity, then any suitable elastic substance may be used.

Under this head of the invention, the claim is for the manufacture of cellular fabrics by uniting together sheets of prepared India-rubber vellum, tissue, vegetable leather, or such other like or equivalent India-rubber fabric, at given intervals, to form cells, in the manner above set forth.

The third part of the invention relates to the method of making what the patentee terms "strong cloth," which is composed of India-rubber and a bat or fleece of cotton, or other fibrous substance.

The method heretofore essayed for forming fabrics of India-rubber and a bat of cotton or other fibrous substance, was, to pass the bat or fleece of fibres, together with a sheet of prepared India-rubber in the green state (that is, before the same has been subjected to the curing process), between calendering rollers, to force the fibres into the sheet of rubber; or to pass the bat or fleece of cotton or other fibrous substance, together with dissolved India-rubber or caoutchouc, between calendering rollers. This method is attended with serious difficulties. In the first place, the India-rubber, or vegetable gum, when softened simply by the action of heat, still preserves so much tenacity that the fibres of the bat can only be forced into it in a very imperfect manner; and therefore the sheet of gum receives but a slight increase of strength. In the second place, when the bat, in passing between the calendering rollers, comes in contact with a solid or unyielding surface, it becomes so matted by the pressure as to prevent the passage of the gum between the fibres. In the third place, if, instead of using the gum simply softened by heat, dissolved gum be used in passing between the calendering rollers, the gum in that state will adhere to the surface of that calendering roller which is directly in contact with it; and the solid surface of the other calendering roller will so mat the fibres of the bat or fleece as to prevent the liquid gum from passing through. The object of this part of the invention is to avoid these difficulties, and thereby allow of a fabric being produced in which the fibres of the bat or fleece will become thoroughly incorporated with the gum, and thus acquire a strength greater than heretofore attained by any other method.

The improvement in the manufacture of such fabrics consists in passing the bat or fleece of cotton or other fibrous substance, together with the dissolved India-rubber, or the preparations thereof, between calendering rollers, with the bat or fleece in contact with an elastic substance, either sur-

rounding one roller, or passing between the rollers which press on the surface of the bat or fleece,—a glazed or other apron being interposed between the gum and the roller not in contact with the elastic substance.

For carrying into practice this part of the invention, the patentee takes two calendering rollers, such as are usually employed by India-rubber manufacturers, and places them in the same horizontal plane, or nearly so. Around one of these rollers he passes an endless apron of glazed cloth, which also passes around another roller, whereby it is kept in a distended state. Around the other calendering roller he passes an endless apron of woollen-felt cloth, or other elastic substance (giving the preference, however, to the woollen-felt cloth); and this also passes around another roller, to keep it in a distended state. If desired, however, instead of the endless apron of felt or other elastic cloth, the calendering roller may be simply covered over with such elastic substance; but the endless apron will be found to be the best in practice. The machine being thus mounted, and the rollers geared and put in motion in the usual manner, the India-rubber, or the preparation thereof, is spread on to the glazed apron, and a bat or fleece of cotton or other fibrous substance introduced between the elastic apron and the dissolved gum; and the whole is caused to pass between the rollers, by which the gum will be forced entirely through the bat or fleece,—thus incorporating or uniting the fibres with the gum. The fabric so produced will pass from the rollers, adhering to the surface of the glazed cloth, from which it can be readily removed.

If the gum is sufficiently liquid or soft, the fabric thus made will be porous to a certain degree, so as to permit the passage of air or perspiration, and obstruct the passage of water to a certain extent. By an additional coat of gum, less liquid or soft, this fabric will be rendered air and waterproof. The fabric may be submitted to the curing or vulcanizing process, or not, as may be desired. When it is desired to give the fabric great strength, and render it applicable for ships' sails, or other like purposes, the inventor places, either by hand or machinery, fibrous threads or cords, or strips, or wires, at suitable distances apart from each other, parallel to or crossing each other, or otherwise arranged, between two sheets of the fabric which are to be united; or he cements the threads, cords, strips, or wires, upon the surface of the fabric.—[*Inrolled December,* 1850.]

Scientific Notices.

ON THE MANUFACTURE OF PRUSSIATE OF POTASH.

All things considered, the manufacture of prussiate of potash is, perhaps, less understood, and therefore less perfect than that of any other chemical substance of equal importance. The conditions requisite to ensure success are totally unknown amongst scientific men, and the manufacturers themselves seem so divided in their opinions respecting the best modes of production, that nothing valuable can be deduced from the discordant results of their experience. Thus, whilst some are so careful to avoid the presence of water in the materials they employ, that these are highly dried before being cast into the furnace pot, others pay no regard at all to this circumstance, or even actually wet the nitrogenised substances, with a view to increase their power. The difference in theory between these methods is so enormous, that it ought, long ago, to have shewn itself in the practical results, if there be not some error in the assertion that prussiate of potash is entirely destroyed by steam at a red heat. That such is the case when pure prussiate is thus acted on, no one can doubt for a moment; but how far this is true with respect to the mixture of carbonaceous and alkaline matters contained in the furnace pot of a prussiate manufacturer, remains still to be investigated. Whatever be the plan adopted, a prodigious waste invariably occurs in making prussiate of potash; and fully two-thirds of all the nitrogen, existing in the azotised ingredients of the process, are driven off and lost. More frequently, indeed, the loss amounts to three-fourths, and even this is sometimes exceeded. The state of the weather, and the temperature of the furnace also largely affect the production of prussiate of potash,—for damp, foggy weather, and a low, dull heat, are extremely prejudicial. The most favorable indications are, a heat verging on whiteness, and the production of a clear, bright flame, the moment the materials are thrown into the pot.

Woollen rags or clippings, and good American potash or pearlash, with an admixture of scrap iron, have given a larger produce than any other substance within the range of our experience, though, even in this instance, two-thirds of the whole nitrogen passed away as ammonia. In general, one ton of dried blood, or woollen rags, with about 3 cwts. of

good potash, will produce from 2 cwts. to 2½ cwts. of prussiate of potash, and a proportionate amount of sulphate of potash. The presence of scrap iron in a proper state of subdivision is, however, necessary to insure the above result; for when no more is supplied than that which arises accidentally from the iron pot in which the operation is carried on, scarcely half these proportions will be obtained. A very useful mixture may be made of one ton of proper nitrogenised matter in a dry condition, with from 3 to 4 cwts. of pearlash in powder, and 50 or 60 lbs. of scrap iron in the form of wire, or thin sheets or clippings. This is to be projected by degrees into a thick iron pot previously brought to a bright cherry-red heat; and, after each addition, the whole contents of the pot must be well stirred with a heavy iron poker or bar, until the residue becomes pasty; when more of the mixture must be thrown in and similarly treated, until the pot is about half full; after this, the heat may be maintained for fifteen or twenty minutes; and then the charge must be ladled out to make room for another operation. The form and nature of the iron pot are by no means matters of indifference. The form should be such as to prevent the access of air as much as possible, without causing unnecessary labor to the workman in the charging and emptying of the pot; and, in consequence of the high temperature employed, the cast-iron should be of the kind called "cold-blast iron;" for this will resist a much greater application of fire than "hot-blast iron." The old shape of a prussiate of potash pot is almost exactly that of an egg, with its upper part cut off; and this, in an economical point of view, is scarcely susceptible of improvement; but the pasty mass, after each operation, can be removed from this pot with great difficulty only; and the mixing or stirring is still more open to objection. Nevertheless, many manufacturers continue to employ this form. More recently, a kind of oblong shallow trough has come into use, which presents every facility for charging and discharging; but the waste of nitrogen is said to be considerable, and the wear and tear excessive; so that a middle shape, or combination of the two, appears indicated. We have, however, witnessed the employment of common gas-retorts for this purpose, and with the most unqualified success. In these, the action of the air is entirely prevented, and the stirring process goes on through an opening in the cover, which, being provided with a plug or stopper, permits the occasional condensation of much of the waste ammonia to

take place; or, by the use of what are called "reciprocating retorts," enables the manufacturer to pass the volatile matters, arising from a recent charge, over the incandescent materials of an old or spent charge, so as to convert the ammonia they contain into cyanogen.

The first steps of the operation being finished, the pasty mass is commonly allowed to cool and harden ere it is roughly powdered and boiled in water. Some manufacturers, however, plunge it at once, whilst still red hot, into cold water, and fancy that some advantage is thus gained. In a theoretical view, the proper course would be to cover up the red-hot mass, so as to obstruct both the access of air and moisture, and thus prevent the decomposition of the cyanide of potassium during the process of cooling. As the prussiate of potash is extremely soluble in boiling water, the fused mass rapidly disintegrates beneath the action of this fluid; and, in a short time, the whole is resolved into a solution of the prussiate, carbonate, and sulphate of potash, and into an insoluble magma of carbon and scrap-iron. By filtration, the saline fluid is separated from the insoluble portion; and, after evaporation, furnishes crystals of prussiate of potash, mixed with sulphate of potash, which, by re-solution and crystallization, are rendered sufficiently pure for the market.

Some years ago, the Society of Arts presented their gold medal to Mr. L. Thompson, for his discovery of the manufacture of prussiate of potash by means of the nitrogen of the air; and several patents have since been taken out for improvements in the apparatus needed to render this discovery available. The process is at present conducted on a large scale at Newcastle-upon-Tyne, and seems to answer the object contemplated. We have not, however, had an opportunity of becoming acquainted with its commercial advantages, though, on sanitary grounds, these are of the highest importance. The fact that atmospheric nitrogen can be brought into chemical union is, nevertheless, thoroughly established by this discovery,—which should therefore stimulate inventors to further efforts for utilising this great storehouse of azote. If nitrogen can be made to unite with carbon, why should it not also be made to combine with hydrogen, and thus produce ammonia? Twenty years ago the one of these combinations was seemingly as improbable as the other.

Much attention has of late been drawn to the cyanogen compounds evolved during the distillation of coal in the manufacture of gas; and it must be confessed that a wide field

for improvement is opened in this direction. The quantity of cyanogen given off during the decomposition of one ton of common Newcastle coal is sufficient to produce about seven pounds of Prussian blue, which, at the existing market price, would greatly exceed the total value of the coal. The cyanogen is most probably evolved in the form of cyanide of ammonium, and therefore requires protoxide of iron for the purpose of rendering it a fixed and permanent salt. Hence, if either the protoxide or peroxide of iron be placed, so that the gaseous constituents of the coal are made to pass through or over these oxides, a quantity of Prussian blue, and prussiate of ammonia, are generated; and this process may be repeated until almost the whole of the oxide of iron has been converted into ferrocyanic acid and Prussian blue. We have said, that the peroxide of iron will answer this end as well as the protoxide; but, in reality, it is still the protoxide which acts, for the impure coal-gas always contains sulphuretted hydrogen; and this, as is well known, has the property of reducing the peroxide of iron to the protoxide; consequently, both are equally efficacious in the production of ferrocyanic acid. When impure coal-gas, therefore, has been passed, for some time, over either of the oxides of iron, a substance results, from which prussiate of potash may be obtained, at a rate which must, one day, lead to the total suppression of the present mode of making that article. Let us suppose, for example, that a few pounds of oxide of iron have been mingled with sawdust, and subjected to the action of the impure gas arising from the distillation of fifty tons of coal: then sufficient cyanogen must have combined with the iron to generate thirty-five pounds of Prussian blue, and this too without the least expense. Now these thirty-five pounds of Prussian blue, when treated with caustic lime and sulphate of potash, would afford oxide of iron, sulphate of lime, and prussiate of potash, by double decomposition,—the latter of which would require only to be crystallized from the fluid in which it was dissolved; whilst the sulphate of lime and oxide of iron might be returned again to the position formerly occupied by the oxide of iron alone, and there made to combine with a fresh portion of cyanogen; and so on, time after time. We have seen some cwts. of prussiate of potash prepared in this way by Mr. Laming, of the Chemical Works, Millwall, and can answer for the purity and value of the article. Mr. Laming has also manufactured, in a similar manner, several beautiful samples of Prussian blue. There is, however, an art connected with

the production of Prussian blue, which requires more than mere purity of materials; for if an inexperienced individual were to attempt to make a good marketable Prussian blue, even though possessed of the purest re-agents, he would certainly fail to bestow upon it the essential conditions of color and cohesion, by which alone it attains a commercial value. The old mode of obtaining this article, in a proper state, was by precipitating a solution of common copperas, or protosulphate of iron, by a mixed solution of the carbonate and ferrocyanate of potash, and allowing the mixed precipitate of oxide and prussiate of iron to remain, for three weeks, in contact with the air; when it was, in technical language, "brightened" by the addition of a dilute acid, generally muriatic. The theory of this process appears to have been this— in the first place protocyanide and protocarbonate of iron were precipitated together, and these, by exposure to the air, passed into the state of peroxide of iron and Prussian blue; the peroxide of iron meanwhile acting mechanically, and preventing the particles of Prussian blue from cohering together and becoming one hard mass, as invariably happens when no such impediment to cohesion is present. Having attained this end, the dilute muriatic acid was employed to dissolve away the superfluous oxide of iron, and thus bring out the brilliancy of the blue color whilst it increased the peculiar spongy and friable nature of the product, and this, after copious ablutions of hot water, was next dried on a stone and sent to market. The practice of the present day is, however, much simpler and speedier than this; for, instead of three weeks, scarcely three days are now necessary for the production of Prussian blue. The plan generally followed is, to dissolve, in two separate portions of boiling water, exactly as much protosulphate of iron and prussiate of potash as will mutually decompose each other; and, for this purpose, nothing but actual experiment must be depended on, as the atomic numbers of these substances do not give a good result. Assuming, however, that some given quantity of the one fluid has been found equal to a given proportion of the other, and that, when mixed and thrown on a filter, neither iron nor ferrocyanic acid can be detected in the filtered fluid, then the mixture is made in these proportions, and a quantity of recently-precipitated peroxide of iron having been added, the whole is rapidly boiled for several minutes; after which it is allowed to cool, and is then "brightened" by a dilute acid, copiously washed with warm water, dried on a stove, and rendered fit for the market.

Prior to drying, the color is very often brought down by the addition of inert colorless substances, such as starch, finely-ground rice, china clay, or alumina, according to the object of the manufacturer.

The fabrication of what is termed the red prussiate of potash has now assumed an important position in the arts, and is supposed by some to constitute a kind of secret in the trade. There is, however, in truth, nothing secret about it. The first method of forming this salt was by transmitting chlorine through a solution of the common prussiate of potash, until it ceased to precipitate the persalts of iron; and, as this implied some chemical skill on the part of the operator, the process came to be regarded as both difficult and secret; for an excess of chlorine not only constituted a waste, but, moreover, actually destroyed the red prussiate when formed, and thus led to a total failure. Now, however, this article is manufactured in the dry way, and the ill effects of an excess of chlorine are easily obviated. To prepare it a quantity of the ordinary yellow prussiate of potash must be reduced to a very fine powder, and subjected to the action of chlorine gas, with repeated agitation,—such, for example, as that which can be produced in a churn. In this way the chlorine is rapidly absorbed, and chloride of potassium and red prussiate of potash generated. When it is found that the chlorine passes freely through the mixture, without being absorbed, the process must be stopped and the powder withdrawn. This powder, on being dissolved in the smallest possible quantity of water, heated to about 180° Fahr., will produce, on cooling, long needle-shaped crystals of the red prussiate of potash, which may be rendered purer and larger by recrystallization in the usual way; the chloride of potassium, meanwhile, remaining dissolved in the mother-liquor. It is far from improbable that this salt might be made by means of the permanganate of potash, or chameleon mineral, as the manganesic acid parts with its oxygen with extreme facility when in solution. If this supposition should turn out to be correct, then a saving would occur in the process, even independently of the cost of chlorine,—for no chloride of potassium would be formed from the potash of the yellow prussiate. This subject merits a careful investigation by those interested in this branch of manufacture, for the red prussiate is rapidly extending in use amongst dyers and calico printers.

PATENT LAW AMENDMENT BILL.

THE present age has been truly called an age of progress; for, turn in what direction we may, and it will not be difficult to trace the markings of the chariot wheels of Reform. By many worthy persons, the intelligent activity of late so noticeable in society generally has been mistaken for a morbid desire for change; but there are sufficient indications that, however great the changes may be that we are now witnessing, they have come upon us suddenly only because we were regardless of the faint yet certain evidences of their approach. There could not, perhaps, be a better proof of the existence among us of the conservative tendency which we have imbibed from our forefathers, than that presented by the measured steps with which the legislature has at last arrived at the reform of the patent laws. So long ago as the 12th June, 1829, a Select Committee of the House of Commons, appointed to enquire into the state of the law and practice relating to the grant of letters patent for inventions, reported that "the subject is, in its nature, so intricate and *important*, that it has occasioned the necessity of examining witnesses at great length; at the present late period of the session, they are only prepared to report the minutes of the evidence taken before them, together with several documents; *and they earnestly recommend to the House, that the enquiry may be resumed early in the next session.*" After a lapse of twenty-two years, this "important" enquiry was renewed, but by another branch of the legislature. Upon the evidence given last year before a Committee of the House of Lords, a Patent Bill was founded, according to the rule contrary, as regards many important particulars; and this Bill, having passed through their Lordships' House, was sent down to the Commons, where some of the obnoxious clauses, which were opposed to the mass of evidence taken by the Committee, have been remodelled or expunged. The amended Bill, having passed the third reading in the Commons, has been sent up to the Lords for their approval, and will most probably become the law of the land ere these remarks are issued from the press. Under this belief, we propose to give an abstract of the Bill, and to comment upon its provisions, as far as respects the granting of patents,—reserving for another opportunity a more detailed examination of the several clauses which have a direct bearing upon the interests of inventors. It is with no little satisfaction that we are enabled to say, that the

Bill, although it regulates the mode of conducting actions in cases of infringements, and entirely alters the system of granting patents, raises no new points for discussion in the courts of judicature, and leaves undisturbed that chain of recorded decisions which form at once the safeguard of British patentees, and the text book by which the United States courts are guided. Highly as we appreciate the wisdom of Parliament, we think that, in a delicate matter like the settlement of such questions as the validity of patents, where no two cases present exactly similar features, the great probability is, that statute law would be found rather inconvenient than otherwise; at any rate, while justice is administered, as at present, by jurists whose aim appears to be to rival that great judge, who is said to have been "misled by no predilection—seeing what the law ought to be, as well as what it was supposed to be—giving precedent its just weight and no more—able to adapt established principles to the new exigences of social life"—we shall continue to prefer judge-made law to the risk of smarting under "the crude enactments of the legislature."*

We have said that the Bill changes the system of granting patents. This is not, however, obvious to the general reader; for the change will be rather the result of a necessity arising out of the working of the Act, than coming from any positive enactment. Thus, under the old, or present system, every encouragement was given to inventors to perfect their schemes before applying for a patent; whereas, by the new Bill, inventors will gain security for their discoveries only by going for provisional protection immediately the idea of a possible improvement strikes upon the mind. The necessity for adopting this course will be readily acknowledged, when it is understood that any applicant, who has deposited a provisional specification, will obtain protection for the invention therein described so soon as the Attorney or Solicitor-General shall have approved of that document; and that without the possibility of the public knowing anything of such applicant's proceedings. At a subsequent stage,—that is, when the holder of a provisional protection signifies his intention of applying for letters patent,—any person who considers himself aggrieved by the proceedings of an applicant for a patent, may enter an opposition thereto, as at present; but inasmuch as such applicant may, under his provisional protection, expose his invention, without detriment to the validity of letters patent afterwards granted, it follows, that the law officer of the crown, before whom the opposition is heard, cannot receive the evi-

* Lord Campbell's Lives of the Chief Justices, Vol. II., p. 170.

dence of *similarity of invention* as a bar to granting the patent; for he would naturally say—"You had the means of obtaining this information from the public acts of the applicant himself, against which he is secured by his provisional protection." It is quite clear, therefore, that it is useless to oppose the grant of a patent on any other grounds than that of *fraud*, or *prior public user*; for proof of prior knowledge, without prior public working, would go to shew that there was no intention of giving the benefit of the invention to the public. Thus, the opposer of the grant would stand in the light of a monopolist, as compared with the intending patentee, who would take the position of the public benefactor. The provisions of the Bill are to be carried out by or under the sanction of Commissioners, consisting of the Lord Chancellor, the Master of the Rolls, and the law officers for the three kingdoms; to whom power is granted to make rules and regulations for determining the practice that is to be followed. A petition and declaration, accompanied by a provisional specification, setting out, in general terms, the nature of the invention for which protection is sought, is to be left at the office of the Commissioners; or, if preferred, a complete specification, fully describing the invention, may be deposited; and these papers are referred to a law officer of the crown. If the applicant's title and description are approved of, a certificate of provisional protection for six months is granted him, at the cost of £5, such protection bearing date from the day of application; and, unless he applies for his patent during the existence of the provisional protection, his right to the grant of letters patent will cease; and the specification which he has lodged will be made public. On an application for letters patent being duly made, the same will be advertised, to court opposition; and, if no tenable objection is raised thereto, the patent will issue on the payment of £15, and bear date as of the day of the application. The grant, instead of being confined to one kingdom, as at present, will extend over the three kingdoms, and such of the colonies as the patent may recite; and it will contain the usual proviso respecting the deposit of a specification, unless the complete specification, under the rule before mentioned, was deposited on applying for the provisional protection. Besides this, there will be a proviso that the patent, the term of which is fourteen years, shall cease and determine at the expiration of the third year, and of the seventh year, respectively, unless the sum of £50 be paid at the first-mentioned period, and a further sum of £100 at the second period; added to which, a fee of £5

is to be paid on the filing of the specification,—making in all a sum of £175 government fees for a British patent. It will be understood, that it is optional with the patentee whether to pay the sums which become due at the end of the third and the seventh years of the grant, or to vacate his rights;—indeed, it is thought that many useless patents will be dropped at the third year; and that much public good will result therefrom. In what way the public is to be benefitted by the possession of a nonentity—for absurd inventions can be said to have merely a visionary existence—is not very intelligible to us; but we can see an evident evil in the spreading of the payments over a period of years; and it is this, viz., that patentees may and will, by inadvertence, let slip the privileges to which they have become justly entitled by their assiduous labor and enterprise: when such things happen, we perceive an advantage which the public may derive; but it will, in our opinion, be through little short of a legalized robbery. We would call especial attention to clause X., which must go far to reconcile all persons interested in new inventions to the present Bill. It provides that the obtaining of provisional protection in fraud of the true and first inventor, will not deprive him of his right to a valid patent subsequently applied for. This meets the evil which has often been felt under the present system,—that, although a person, defrauded of his rights, might, by sueing out a writ of *scire facias*, break down a patent which had been obtained for his invention, yet, by doing so, he would give the public the benefit of his labors, instead of regaining possession of his rights. We have said that the duration of patents will be, as formerly, fourteen years; but, in the case of imported or foreign inventions, the patent is to cease and become void immediately on the expiration of the foreign patent first obtained for the same invention. The Bill also proposes to print and publish verbatim copies of all specifications—which are to be received as evidence in all courts of law,—and to give to every patentee twenty-five copies of his specification. Indexes are likewise to be prepared of the old specifications, and printed and published by the Commissioners. How these provisions will work we are somewhat at a loss to know; but, if we may judge from the success of a similar scheme in France, we think that inventors will have to wait a long while before they can bring actions for infringements of their patents, if no other than the printed copies of specifications issued by the Commissioners are admissible as evidence. There are some admirable provisions contained in the Bill (due, we believe, to Lord Brougham)

respecting the pleadings in defending actions for infringement, and for the repeal of patents, by which the patentee will be informed of the grounds of his opponent's attack. The following is an abstract of the Bill, the clauses of general interest being given in full:—

Clauses I. II. III. IV. and V. refer to the appointment of Commissioners, to whom power is given to provide a seal of office, to make rules and regulations, which are to be reported to Parliament—to the providing of suitable offices by the Treasury—and the appointment of clerks, &c.

VI. Every petition for the grant of letters patent for an invention, and the declaration required to accompany such petition, shall be left at the office of the Commissioners; and there shall be left therewith a statement in writing, hereinafter called the provisional specification, signed by or on behalf of the applicant for letters patent, describing the nature of the said invention; and the day of the delivery of every such petition, declaration, and provisional specification, shall be recorded at the said office, and endorsed on such petition, declaration, and provisional specification, and a certificate thereof given to such applicant or his agent; and all such petitions, declarations, and provisional specifications, shall be preserved in such manner as the Commissioners may direct, and a registry thereof, and of all proceedings thereon, kept at the office of the Commissioners.

VII. Every application for letters patent made under this Act shall be referred by the Commissioners, according to such regulations as they may think fit to make, to one of the law officers.

VIII. The provisional specification shall be referred to the law officer, who shall be at liberty to call to his aid such scientific or other person as he may think fit, and to cause to be paid to such person, by the applicant, such remuneration as the law officer shall appoint; and if such law officer be satisfied that the provisional specification describes the nature of the invention, he shall allow the same, and give a certificate of his allowance; and such certificate shall be filed in the office of the Commissioners, and thereupon, the invention therein referred to may, during the term of six months from the date of the application for letters patent for the said invention, be used and published without prejudice to any letters patent to be granted for the same; and such protection from the consequences of use and publication is hereinafter referred to as provisional protection: provided always, that in case the title of the invention, or the provisional specification, be too large, or insufficient, it shall be lawful for the law officer, to whom the same is referred, to allow or require the same to be amended.

IX. The applicant for letters patent for an invention, instead of leaving, with the petition and declaration, a provisional specification, as aforesaid, may, if he think fit, file, with the said petition and declaration, an instrument in writing under his hand and seal (hereinafter called a complete specification), particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed, which complete specification shall be mentioned in such declaration; and the day of the delivery of every such petition, declaration, and complete specification, shall be recorded at the office of the Commissioners, and endorsed on such petition, declaration, and specification, and a certificate thereof given to such applicant, or his agent; and thereupon, subject and without prejudice to the provisions hereinafter contained, the invention shall be protected under this Act for the term of six months from the date of the application; and the applicant shall have, during such term of six months, the like powers, rights, and privileges, as might have been conferred upon him by letters patent for such invention, issued under this Act, and duly sealed as of the day of the date of such application; and, during the continuance of such powers, rights, and privileges, under this provision, such invention may be used and published without prejudice to any letters patent to be granted for the same; and where letters patent are granted in respect of such invention, then, in lieu of a condition for making void such letters patent, in case such invention be not described and ascertained by a subsequent specification, such letters patent shall be conditioned to become void if such complete specification, filed as aforesaid, does not particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed; and a copy of every such complete specification shall be open to the inspection of the public, as hereinafter provided, from the time of depositing the same, subject to such regulation as the Commissioners may make.

X. In case of any application for letters patent for any invention, and the obtaining, upon such application, of provisional protection for such invention, or of protection for the same, by reason of the deposit of a complete specification, as aforesaid, in fraud of the true and first inventor, any letters patent granted to the true and first inventor of such invention shall not be invalidated by reason of such application, or of such provisional or other protection, as aforesaid; or of any use or publication of the invention subsequent to such application, and before the expiration of the term of such provisional or other protection.

XI. Where any invention is provisionally protected under this Act, or protected by reason of the deposit of such complete specification, as aforesaid, the Commissioners shall cause such provisional protection, or such other protection, as aforesaid, to be advertised in such manner as they may see fit.

XII. The applicant for letters patent, so soon as he may think fit, after the invention shall have been provisionally protected under this Act, or where a complete specification has been deposited, with his petition and declaration, then, so soon as he may think fit after such deposit, may give notice, at the office of the Commissioners, of his intention of proceeding with his application for letters patent for the said invention; and thereupon the said Commissioners shall cause his said application to be advertised in such manner as they may see fit; and any persons having an interest in opposing the grant of letters patent for the said invention, shall be at liberty to leave particulars, in writing, of their objections to the said application, at such place, and within such time, and subject to such regulations as the Commissioners may direct.

XIII. So soon as the time for the delivery of such objections shall have expired, the provisional specification, or complete specification (as the case may be), and particulars of objection (if any) shall be referred to the law officer to whom the application has been referred.

XIV. It shall be lawful for the law officer to whom any application for such letters patent is referred, if he see fit, by certificate under his hand, to order by or to whom the costs of any hearing or inquiry upon any objection, or otherwise—in relation to the grant of such letters patent, or in relation to the provisional [or *other*] protection acquired by the applicant under this Act—shall be paid, and in what manner, and by whom, such costs are to be ascertained; and if any costs so ordered to be paid be not paid within four days after the amount thereof shall be so ascertained, it shall be lawful for such law officer to make an order for the payment of the same; and every such order may be made a rule of one of Her Majesty's superior courts at Westminster.

XV. It shall be lawful for such law officer, after such hearing, if any, as he may think fit, to cause a warrant to be made for the sealing of letters patent for the said invention; and such warrant shall be sealed with the seal of the Commissioners, and shall set forth the tenor and effect of the letters patent thereby authorized to be granted; and such law officer shall direct the insertion, in such letters patent, of all such restrictions, conditions, and provisos, as he may deem usual and expedient in such grants, or necessary in pursuance of the provisions of this Act; and the said warrant shall be the warrant for the making and sealing of letters patent under this Act, according to the tenor of the said warrant: provided always that the Lord Chancellor shall and may have and exercise such powers, authority, and discretion, in respect to the said warrant, and the letters patent therein directed to be made under this Act, as he now has and might now exercise with respect to the warrant for the issue, under the Great Seal, of letters patent

for any invention, and with respect to the making and issuing of such letters patent; and the writ of *scire facias* shall lie for the repeal of any letters patent issued under this Act, in the like cases as the same would lie for the repeal of letters patent which may now be issued under the Great Seal.

Clause XVI. provides, that the prerogative of the Crown, as respects the granting, or the withholding of the grant, of letters patent, shall not be affected by the Bill.

XVII. All letters patent for inventions granted under the provisions hereinbefore contained, shall be made subject to the condition that the same shall be void, and that the powers and privileges thereby granted shall cease and determine, at the expiration of three years and seven years respectively, from the date thereof, unless there be paid, before the expiration of the said three and seven years respectively, the sum or sums of money and stamp duties in the schedule to this Act annexed; and the payment of the said sums of money and stamp duties respectively shall be endorsed on the warrant for the said letters patent; and such officer of the Commissioners as may be appointed for this purpose shall issue under the seal of the Commissioners a certificate of such payment, and shall endorse a receipt for the same on any letters patent issued under the authority of the said warrant; and such certificate, duly stamped, shall be evidence of the payment of the several sums respectively.

XVIII. The Commissioners, so soon after the sealing of the said warrant as required by the applicant for the letters patent, shall cause to be prepared letters patent for the invention, according to the tenor of the said warrant; and it shall be lawful for the Lord Chancellor to cause such letters patent to be sealed with the Great Seal of the United Kingdom; and such letters patent so sealed shall extend to the whole of the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man; and in case such warrant so direct, such letters patent shall be made applicable to Her Majesty's colonies and plantations abroad, or such of them as may be mentioned in such warrant, and such letters patent shall be valid and effectual as to the whole of such United Kingdom, and the said islands and isle, and shall confer the like powers, rights, and privileges, as might, in case this Act had not been passed, have been conferred by several letters patent of the like purport and effect passed under the Great Seal of the United Kingdom, under the seal appointed to be used instead of the Great Seal of Scotland, and under the Great Seal of Ireland respectively, and made applicable to England, the Dominion of Wales, the town of Berwick-upon-Tweed, the Channel Islands, and Isle of Man, to Scotland, and to Ireland, respectively, save as herein otherwise provided: provided always, that nothing in

this Act contained shall be deemed or taken to give any effect or operation to any letters patent to be granted under the authority of this Act in any colony in which such or the like letters patent would be invalid by the law now in force in the same colony.

XIX. Provided always, that no letters patent, save as hereinafter mentioned in the case of letters patent destroyed or lost, shall issue on any warrant granted as aforesaid, unless application be made to seal such letters patent within three months after the date of the said warrant.

XX. Provided also, that no letters patent (save letters patent issued in lieu of others destroyed or lost) shall be issued or be of any force or effect unless the same be granted during the continuance of the provisional protection under this Act,—or where a complete specification has been deposited under this Act, then unless such letters patent be granted during the continuance of the protection conferred under this Act, by reason of such deposit, save that where the application to seal such letters patent has been made during the continuance of such provisional or other protection as aforesaid, and the sealing of such letters patent has been delayed by reason of a caveat or an application to the Lord Chancellor against or in relation to the sealing of such letters patent, then such letters patent may be sealed at such time as the Lord Chancellor shall direct.

XXI. Provided also, that where the applicant for such letters patent dies during the continuance of the provisional protection, or the protection by reason of the deposit of a complete specification (as the case may be), such letters patent may be granted to the executors or administrators of such applicant during the continuance of such provisional or other protection, or at any time within three months after the death of such applicant, notwithstanding the expiration of the term of such provisional or other protection, and the letters patent so granted shall be of the like force and effect as if they had been granted to such applicant during the continuance of such provisional or other protection.

XXII. Provided also, that in case any such letters patent shall be destroyed or lost, other letters patent of the like tenor and effect, and sealed and dated as of the same day, may, subject to such regulations as the commissioners may direct, be issued under the authority of the warrant in pursuance of which the original letters patent were issued.

XXIII. It shall be lawful (the Act of the eighteenth year of King Henry the Sixth, chapter one, or any other Act, to the contrary notwithstanding) to cause any letters patent to be issued in pursuance of this Act to be sealed and bear date as of the day of the application for the same; and in case of such letters

patent for any invention provisionally registered under the "Protection of Inventions Act, 1851," as of the day of such provisional registration, or, where the law officer to whom the application was referred, or the Lord Chancellor, thinks fit and directs, any such letters patent as aforesaid may be sealed and bear date as of the day of the sealing of such letters patent, or of any other day between the day of such application or provisional registration and the day of such sealing.

XXIV. Any letters patent issued under this Act, sealed and bearing date as of any day prior to the day of the actual sealing thereof, shall be of the same force and validity as if they had been sealed on the day as of which the same are expressed to be sealed and bear date: provided always, that save where such letters patent are granted for any invention, in respect whereof a complete specification has been deposited upon the application for the same under this Act, no proceeding at law or in equity shall be had upon such letters patent in respect of any infringement committed before the same were actually granted.

XXV. Where, upon any application made after the passing of this Act, letters patent are granted in the United Kingdom for or in respect of any invention first invented in any foreign country, or by the subject of any foreign power or state, and a patent or like privilege, for the monopoly or exclusive use or exercise of such invention in any foreign country, is there obtained before the grant of such letters patent in the United Kingdom, all rights and privileges, under such letters patent, shall (notwithstanding any term in such letters patent limited) cease and be void immediately upon the expiration or other determination of the term during which the patent or like privilege, obtained in such foreign country, shall continue in force, or where more than one such patent or like privilege is obtained abroad, immediately upon the expiration or determination of the term which shall first expire or be determined of such several patents or like privileges.

By Clause XXVI., the use, in a foreign vessel navigating the English seas, of a patented invention—not being for the manufacture of a vendable commodity—will not be deemed an infringement of that patent.

XXVII. All letters patent, to be granted under this Act (save only letters patent granted after the filing of a complete specification), shall require the specification thereunder to be filed in the High Court of Chancery, instead of requiring the same to be enrolled, and no enrolment shall be requisite.

Clause XXVIII. provides the appointment of an office in Chancery for the filing of specifications.

XXIX. The Commissioners shall cause true copies of all specifications (other than provisional specifications), disclaimers, and

memoranda of alterations, filed under or in pursuance of this Act, and of all provisional specifications, after the term of the provisional protection of the invention has expired, to be open to the inspection of the public at the office of the Commissioners, and at an office in Edinburgh and Dublin respectively, at all reasonable times, subject to such regulations as the Commissioners may direct.

XXX. The Commissioners shall cause to be printed, published, and sold at such prices, and in such manner as they may think fit, all specifications, disclaimers, and memoranda of alterations deposited or filed under this Act, and such specifications (not being provisional specifications), disclaimers, and memoranda, respectively, shall be so printed and published as soon as conveniently may be after the filing thereof respectively; and all such provisional specifications shall be so printed and published as soon as conveniently may be after the expiration of the provisional protection obtained in respect thereof; and it shall be lawful for the Commissioners to present copies of all such publications to such public libraries and museums as they may think fit, and to allow the person depositing or filing any such specification, disclaimer, or memorandum of alteration, to have such number, not exceeding twenty-five, of the copies thereof, so printed and published, without any payment for the same, as they may think fit.

Clauses from XXXI. to XXXIX., inclusive, refer to the keeping of the recorded specification; to the making of indexes, and the printing of the same, and also of specifications and disclaimers,—such printed copies to be received as evidence in courts of law; also, to the registration of proprietors of patents, and to the enactment of penalties for false entries; and likewise to the application—to patents granted or specifications filed, according to the present Bill—of the Acts now in force for amending specifications and confirming patents.

XL. In any action pending in any of Her Majesty's Superior Courts of Record at Westminster or in Dublin, for the infrigement of letters patent, the plaintiff shall deliver with his declaration particulars of the breaches complained of in the said action, and the defendant, on pleading thereto, shall deliver with his pleas, and the prosecutor, in any proceedings by *scire facias* to repeal letters patent, shall deliver with his declaration, particulars of any objections on which he means to rely at the trial in support of the pleas in the said action, or of the suggestions of the said declaration in the proceedings by *scire facias* respectively; and at the trial of such action or proceeding by *scire facias*, no evidence shall be allowed to be given in support of any alleged infringement or of any objection impeaching the validity of such letters patent which shall not be contained in the particulars

delivered as aforesaid: provided always, that the place or places at or in which and in what manner the invention is alleged to have been used or published prior to the date of the letters patent shall be stated in such particulars: provided also, that it shall and may be lawful for any Judge at Chambers to allow such plaintiff or defendant, or prosecutor, respectively, to amend the particulars delivered as aforesaid, upon such terms as to such Judge shall seem fit: provided also, that at the trial of any proceeding by *scire facias* to repeal letters patent, the defendant shall be entitled to begin and to give evidence in support of such letters patent, and in case evidence shall be adduced on the part of the prosecutor impeaching the validity of such letters patent, the defendant shall be entitled to the reply.

XLI. In any action pending in any of Her Majesty's Superior Courts of Record at Westminster, and in Dublin, for the infringement of letters patent, it shall be lawful for the court in which such action is pending, if the court be then sitting, or if the court be not sitting, then for a Judge of such court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such Court or Judge may seem fit.

Clause XLII. refers to the taxation of costs in actions at law; and Clause XLIII. to the payments and stamp duties recited in the schedule; and by the clauses from XLIV. to LI., inclusive, provision is made for the disposal of the monies received, the defraying of salaries, the granting of compensations, &c.

LII. Where letters patent for England, or Scotland, or Ireland, have been granted before the passing of this Act, or are in respect of any application made before the passing of this Act, hereafter granted for any invention, letters patent for England, or Scotland, or Ireland, may be granted for such invention, in like manner as if this Act had not been passed: provided always that, in lieu of all the fees or payments, and stamp duties now payable in respect of such letters patent, or in or about obtaining a grant thereof, there shall be paid, in respect of such letters patent, for England, or Scotland, or Ireland, on the sealing of such respective letters patent, a sum equal to one-third part of the fees and stamp duties, which would be payable, according to the schedule to this Act, in respect of letters patent issued for the United Kingdom, under this Act, on or previously to the sealing of such letters patent; and at or before the expiration of the third year and the seventh year respectively, of the term granted by such letters patent for England, or Scotland, or Ireland, sums equal to one-third part

of the fees and stamp duties payable at the expiration of the third year and the seventh year respectively, of the term granted by letters patent issued for the United Kingdom under this Act; and the condition of such letters patent for England, or Scotland, or Ireland, shall be varied accordingly; and such fees shall be paid to such persons as the Commissioners of Her Majesty's Treasury shall appoint, and shall be carried to and form part of the said consolidated fund.

The remaining clauses refer to the forms to be used in applying for patents, explain certain "expressions" in the Bill, set out the "title," and provide that the Act shall come into operation on the 1st of October.

Schedule of Fees to be Paid.

	£	s.	d.
On leaving petition for grant of letters patent	5	0	0
On notice of intention to proceed with the application	5	0	0
On sealing of letters patent	5	0	0
On filing specification........................	5	0	0
At or before the expiration of the third year........	40	0	0
At or before the expiration of the seventh year......	80	0	0
On leaving notice of objections	2	0	0
Every search and inspection	0	1	0
Entry of assignment or licence	0	5	0
Certificate of assignment or licence	0	5	0
Filing application for disclaimer	5	0	0
Caveat against disclaimer	2	0	0

Stamp Duties to be Paid.

On warrant of law officer for letters patent	5	0	0
On certificate of payment of the fee payable at or before the expiration of the third year	10	0	0
On certificate of payment of the fee payable at or before the expiration of the seventh year	20	0	0

INSTITUTION OF CIVIL ENGINEERS.

May 18th, 1852.

The paper read was, "*Observations on artificial hydraulic or Portland cement; with an account of the testing of the brick beam erected at the Great Exhibition,*" by Mr. G. F. White, Assoc. Inst. C.E.

After detailing the experiments made by the late Sir Isambard Brunel, the paper noticed the peculiarities in the practice of the

English and foreign engineers in the use of cements and limes. It was stated, that, in England, the natural cements were plentiful, and the mode of construction being generally in brickwork, quick setting cements were preferred; whereas, abroad, the natural cement stones were, comparatively speaking, rare, and the use of bricks rather the exception than the rule. In some cases it was found, that even the best natural hydraulic limes did not set with sufficient rapidity, in salt water, to do away with the necessity for using pozzalanos; and some of the attempts made, at various periods, to substitute artificial pozzalanos for the very expensive natural products of that nature, were then described. The unfavorable results of these attempts, and the manner in which M. Vicat explained them, were detailed. A sketch was then given of the course of investigation followed in England by Mr. Frost and General Sir Charles Pasley, from which it appeared, that, until the introduction of the Portland cements, no artificial compound had been discovered, which possessed the same, or greater, powers of resistance than those of the natural cements. The advantages of the Portland cement were stated to be, that it had nearly all the qualities of rapid setting presented by the natural materials of the same class; and, in addition, that as it was capable of supporting variable proportions of sand, it could be used as a mortar, the rate of setting of which might be modified at will, and the powers of resistance of which were stated to be much greater than those of either the cements or the limes thus replaced.

A general description of the manner in which the Portland cement was now manufactured, and of the methods of testing the article, were then given; and it appeared, that, after seven days, the cohesive strength of the neat cement was equal to about 100lbs. on the square inch; and that, after six months, this became equal to not less than 414 lbs. per square inch. M. Vicat had stated, in 1851, in a communication to the *Annales des Ponts et Chaussées*, that by the use of Portland cement alone, or what he termed "overburnt lime," it would be possible to form immense artificial blocks, capable of resisting the action of the waves and of the shingle upon the sea shore: an action which it was well known rapidly destroyed the natural cements, and the pozzalanic mixtures, whether of natural or artificial pozzalanos.

The several applications of the Portland cement as a concrete, as a mortar, and as a stucco, were then alluded to, and reference was made to the early failures in forming large artificial blocks; and an account was given of the mode now adopted in constructing them at Dover and Alderney harbours of refuge, and likewise of those employed to protect the extremities of the breakwater of Cherbourg. At Dover, the hearting of the piers, below high-water mark, was executed in blocks of concrete, composed of cement and shingle in the proportions of 1 to 10, and occupying about three-fourths of the volume of the separate materials measured in the dry state. Each block contained from 30 cubic feet

to 120 cubic feet, and weighed from 2 tons to 7 tons. At Alderney, a species of concrete, composed of cement, sand, and shingle, was placed in a mould, with rubble stone, bedded irregularly in the mass,—the proportions being about one part of cement to ten parts of foreign materials. At Cherbourg, the system adopted was to build immense blocks of rubble masonry of not less than 712 cubic feet, and weighing about 52 tons. These blocks were floated out from the places where they were constructed, and sunk as "pierre perdue;" but this had not on all occasions been able to resist the transporting power of the waves. The manner of using the cement was in the form of mortar, composed of one part of cement to three parts of sand.

It had been stated by M. Vicat, that the powers of resistance to compression absolutely required, in substances exposed to the action of the sea, must be at least equal to 40 lbs. per square inch, and of that to tension, at least equal to 9 lbs. on the square inch. Now, the resistance of the artificial stone blocks, after an interval of 9 months, was not less than 1700 lbs. per square inch, when the effort was one of compression, or than 200 lbs. per square inch, when it became an effort of tension, or little inferior to that of Portland stone itself.

Attention was called to the fact, that the Portland cement adhered more energetically to the Portland stone than to any other material. This degree of adhesion did not seem to depend so much upon the absorbent powers of the substances connected together by the cement, as upon some coincidence in the manner of their crystallization.

The applications of Portland cement to the purposes of stucco, for external works, were noticed. Its advantages were stated to consist in its agreeable color, without the intervention of paint or limewhite, its power of resisting frost, and its freedom from vegetation: all which were attributed to the close contact of its constituent parts, and to the surface being perfectly non-absorbent. For the same reason, it was asserted that the Portland cement was eminently adapted for the construction of cisterns and baths, and for the various descriptions of statues and fountains, &c., now made of artificial stone.

The paper concluded by a description of the experiments on the brick-beam, at the Great Exhibition of 1851: from which it was deduced that the strength of Portland cement, as compared with Roman cement, was in the ratio of $2\frac{1}{8}$th to 1. Attention was called to the several tables and diagrams, which were exhibited, illustrative of the various power of resistance of the cement under efforts of compression, extension, and tearing asunder.

The session was terminated by the President's conversazione, which took place at the Society's house, on the 25th May, and was numerously attended.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

(Continued from page 485, Vol. XL.)

A paper, "*On a new mode of measuring high temperatures,*" by Mr. JOHN WILSON, of Bridgewater, was next read.

After referring to, and describing briefly the pyrometers at present in use, the paper explained the method employed by the author to measure high temperatures. According to his plan, a given weight of platinum is exposed for a few minutes to the fire, the temperature of which is required to be measured, and then plunged into a vessel containing water of a determined weight and temperature. After the heat of the platinum has been communicated to the water, the temperature of the water is ascertained; and from this is estimated the temperature to which the platinum was subjected. Thus, if the piece of platinum employed be 1000 grains, and the water into which it is plunged be 2000 grains, and its temperature 60°, should the heated platinum when dropped into the water raise its temperature to 90°, then 90°—60°=30°; which, multiplied by 2 (because the water is twice the weight of the platinum), gives 60°, that an equal weight of water would have been raised. Again; should the water in another case gain 40°, then 40°×2=80°, the temperature measured by the pyrometer. To convert the degrees of this instrument into degrees of Fahrenheit, we must multiply by 31·25, or 31¼. Thus, 80°×31¼, would give 2500° of Fahrenheit. And 60° × 31¼ = 1875°. The multiplier 31·25 is the number expressing the specific heat of water as compared with that of platinum,—the latter being regarded as 1.

In order to attain very accurate results by this method, precautions similar to those required in determining the specific heat of bodies must be taken: that is, it is necessary to guard against the dissipation of heat by conduction and radiation. The apparatus used by the author consists of a polished tinned iron vessel, of a cylindrical form, 3 inches deep and 2 inches in diameter; this is placed within a concentric cylinder, separated from the enclosed vessel about ¼ inch. By this means there is but little heat lost during the experiment, either by radiation or conduction.

At the commencement of the experiments, the author imagined it would be necessary to employ a considerable proportion of water, and therefore took twenty-five times the weight of the platinum; but he found that the temperature gained by the water, even in cases of very high heats, did not exceed 4° or 5°,—and an error of 1°, when converted into degrees of Fahrenheit, amounted to 400°. To obtain results within much narrower

limits of error, it became obvious, a much smaller proportion of water should be employed; and ultimately it was found that double the weight of the platinum was in all cases sufficient.

There is no appreciable loss of heat from the evaporation of steam when the hot platinum is plunged into the water;—there is probably no actual contact with the water until the platinum is fairly at the bottom of the water. It is in fact the converse of dropping water on a plate of platinum or iron strongly heated: in which case the water, instead of being suddenly dissipated as steam, assumes the spheroidal form, and runs about over the plate without coming in contact with the heated surface. It is only when the temperature of the metal becomes much reduced that the water is rapidly converted into vapour.

In ascertaining temperatures by this pyrometer, a correction has to be made for the portion of the total heat that is absorbed by

1st, the mercury of the thermometer in the water;
2nd, the glass bulb and stem of the thermometer;
3rd, the iron vessel containing the water;
4th, the heat retained by the piece of platinum.

The portion of the total heat that is absorbed by these several bodies, compared to the portion received by the water, will be in proportion to their several weights, and the specific heat of each compared with water.

						Equivalent grains of water.
Mercury ..	200	grains	$\times \frac{1}{30}$th	specific heat	=	7
Glass	35	"	$\times \frac{1}{6}$th	"		6
Iron......	658	"	$\times \frac{1}{9}$th	"		73
Platinum..	1000	"	$\times \frac{1}{32}$nd	"		31
				Total		117

Therefore the effect of these bodies is equivalent to the addition of 117 grains to the 2000 grains of water,—or $\frac{1}{17}$th has to be added as a correction to all the temperatures obtained by this instrument; or, in other words, the multiplier must be increased from $31\frac{1}{4}$ to 33 in this instrument, and in all similar ones where the weights of the mercury and glass of the thermometer, and of the iron vessel, are the same as stated above.

As the piece of platinum is the most expensive part of the apparatus, it is proposed to use a small piece of baked Stourbridge clay as a substitute for the platinum. The author has found, by experiment, that a piece of Stourbridge clay, 200 grains in weight, when heated to the melting point of silver, and plunged into the tinned vessel containing 2000 grains of water, raises the temperature of the water 41°.

Now, if 1890° Fahrenheit (the melting point of silver) be divided by 41, we obtain 46° as the number corresponding to 1° of this pyrometer; and 46 will therefore be the correct multiplier;

and no corrections are required for any heat abstracted by the thermometer, the tinned vessel, or the piece of clay.

The temperature of all sorts of furnaces and flues of steam-engines, &c., may be readily ascertained by means of the piece of Stourbridge clay.

The Chairman expressed the interest he felt in this new pyrometer that had been brought before the meeting, and considered it an ingenious and efficient instrument. He remembered having had a conversation with the late Professor Daniell on the subject of his pyrometer, and expressing a doubt of the nearness of the approximation in the results obtained from that instrument; in fact, such delicate manipulation was required in using it, that it was scarcely available except in the hands of the inventor himself. But Mr. Wilson's instrument was so extremely simple in the construction and practical application, that an accurate measure of the quantity of heat could be relied upon, with ordinary care in the employment of the instrument. It might be theoretically considered, that quantity of heat was a different point from intensity of heat,—as in the case of voltaic electricity the difference between quantity and intensity was known to be so strongly marked in the different effects produced; and this pyrometer, although measuring correctly the relative quantity of heat required to melt different bodies, might give far from a correct measure of the relative intensity of different fires. However, the same theoretical question applied of course to the ordinary mercurial thermometer, which was also the standard of measure in this pyrometer, and to all thermometers which measured the degree of heat by the relative expansion of any body by heat, whether mercury, iron, or air.

A paper, by Mr. Daniel K. Clark, of Edinburgh, "*On the expansive working of steam in locomotives,*" was next read.

The object of this paper is to shew at what rate, in practice, the efficiency of steam is increased by expansive working in locomotives with the best arrangements of cylinders, valves, and valve-gear, and to point out the conditions on which expansive action may be most successfully carried out.

I. *Of the action and capabilities of the link-motion.*—The action of the valves in the "distribution" of the steam is regulated by three elements—the lap, the lead, and the travel. When these are given, the point of the stroke of the piston at which the steam is admitted to the cylinder, cut off, exhausted, and compressed or shut up, are all deducible by model, by diagram, or by calculation. This can be done whether the valve derives its motion from a single excentric, or from a link-motion; as the motion of the valve is virtually the same in both cases. The way in which the valve is caused to cut off or suppress the steam

earlier by the link-motion, is by shortening the travel of the valve. This is accomplished by means of the reversing gear, in such manner that, whatever be the reduction of travel communicated to the valve, the lead is always at least the same as in full gear, and, with the shifting link, is rather increased. In shortening the travel, not only is the steam cut off at an earlier point of the stroke, but it is also exhausted earlier, and admitted earlier; and the exhaust-port is closed earlier during the return stroke upon the exhaust steam. Thus, by shortening the travel, everything affecting the distribution is done earlier in the course of the steam and return strokes.

In his experiments on the action of steam, the writer employed McNaught's Indicator, which he applied to the front end of one of the cylinders of the engine, and received the alternate motion for the paper cylinder from the end of the piston-rod, through an intermediate lever suspended from the engine-frame. To test the actual state of the valve-gear of each engine at the time of experiment, so far as it affected the distribution, indicator diagrams were obtained from the cylinder, at very low speeds, under each notch of the sector of the reversing gear. The diagrams so obtained, of which some examples were given, were angular and sharply defined, and they shewed, with precision, at what points of the stroke the changes of the distribution took place.

The following table contains the positions of the points of the distribution of an engine (No. 13) on the Caledonian Railway, fitted with shifting links, for every notch of the sector, measured from the beginning of the steam stroke.

The Distribution for No. 13, *C. R. Engine.*

Stroke	20 inches.
Lead in full-gear	$\frac{5}{16}$ „
Ditto in mid-gear	$\frac{9}{16}$ „
Lap................	$1\frac{1}{4}$ „
Travel..............	$4\frac{1}{2}$ „

NO. OF NOTCH.	POINTS OF THE DISTRIBUTION.							
	Cutting-off.		Exhaust.		Compression.		Admission.	
	Inches of Stroke.	Pr. cent. of Stroke.	Inches of Stroke.	Pr. cent. of Stroke.	Inches of Stroke.	Pr. cent. of Stroke.	Inches of Stroke.	Pr. cent. of Stroke.
No. 1, full-gear forward	$12\frac{1}{2}$	63	$17\frac{1}{4}$	86	$2\frac{5}{8}$	13	$\frac{3}{16}$	1
No. 2	$9\frac{3}{4}$	49	$16\frac{1}{4}$	82	$3\frac{3}{4}$	19	$\frac{5}{16}$	2
No. 3	$6\frac{5}{8}$	33	$14\frac{1}{4}$	72	$6\frac{1}{4}$	32	1	5
No, 4, mid-gear forward	$3\frac{1}{8}$	155	$10\frac{3}{4}$	54	$9\frac{1}{2}$	48	$2\frac{1}{8}$	11

From this table, and from the exhibited diagrams, it was observed, that the sooner the steam is cut off, the sooner it is exhausted, the sooner the port is closed for exhaustion, and the sooner the port is opened for the admission of steam.

2nd.—That though every change is made earlier—as measured in parts of the stroke—there is less difference in the position of the points of exhaust, compression, and admission, than in that of the cutting off: consequently, the shorter the admission, the longer is the expansion; as the exhaust point does not recede so much as the point of cutting off.

3rd.—That, by the shifting link-motion, the steam may be cut off at from one-sixth to one-seventh of the stroke.

4th.—That though the exhaust takes place earlier for every increase of expansion, it does not, in any case, take place within the first half of the stroke. For mid-gear, it occurs, in fact, at 54 per cent. of the stroke; and the steam is expanded into $3\frac{1}{2}$ times the length of stroke at which it is cut off.

5th.—That the period of compression, increasing as the admission is reduced, amounts to about one-half stroke in mid-gear.

6th.—That the pre-admission of the steam—not above one per cent. of the stroke in full gear—reaches about 10 per cent. in mid-gear.

These results are for an ordinary shifting link-motion, in every modification of which the lead increases with the degree of expansion, and in which the lead, in this case, rises from $\frac{5}{16}$ths to $\frac{9}{16}$ths inch in mid-gear; whereas, in stationary link-motions, having the links suspended directly from a fixed point, the lead is constant for all degrees of expansion; and if in these the lead be set at $\frac{1}{4}$th to $\frac{5}{16}$ths inch constant, we should be able to cut off at even 10 to 12 per cent. of the stroke, or at $\frac{1}{10}$th to $\frac{1}{8}$th of the stroke. For example, in the diagram from No. 125, C.R. engine (lap $1\frac{1}{4}$ inch, lead $\frac{1}{4}$ inch), the steam is shewn as cut off at $3\frac{1}{2}$ out of 24 inches stroke, or at $\frac{1}{7}$th from the front end of the cylinder. Now, in this engine, as the valve-gearing was slightly out of balance, the steam was cut off 1 inch earlier for the back stroke in mid-gear—that is, at $2\frac{1}{2}$ inches; and the mean of the two, or 3 inches, is the mean admission in mid-gear, or $\frac{1}{8}$th of the stroke.

It has been thought necessary to go into these preliminary explanations, to shew that the link-motion is capable of cutting off steam as early in the course of the stroke as can ever be advisable in practice.

It has been seen, that the earlier the steam is cut off, the earlier also it is exhausted, until, in mid-gear, it may be released at half-stroke. This has been deemed a serious objection to the use of link-motions for high expansion, as it is supposed to lead to a serious loss of expansive action by exhausting prematurely. This loss is, however, a mere trifle in practice.

The author referred to a series of indicator diagrams, taken by Mr. Daniel Gooch, from the cylinder of the Great Britain locomotive, on the Great Western Railway, at the respective speeds of 17 and 55 miles per hour, under the 1st, 3rd, and 5th notches of the sectors, which shewed that the losses at high speeds were merely nominal, and that the loss by the earlier exhaust of the 5th notch was actually less than that under the 1st notch. It plainly appears, therefore, that, with the existing arrangements of locomotives, any attempts to eke out the power on the steam-line, by prolonging the expansion materially beyond what is accomplished by an ordinary valve and link-motion, are not only useless, but highly prejudicial.

Another objection to the link motion is, that the steam is injuriously wiredrawn by it when under great expansion; and hence the numerous attempts to supersede the link by the employment of a separate expansion-valve; but the author shewed, that the objection of wire-drawing by the link-motion, when of liberal proportions, is of no practical weight; as, under high expansion, it will amount to a mean loss on the whole stroke of about 1 lb. per square inch.

Another objection to the link-motion, and apparently the most formidable one, is the large fraction of power neutralized by the compression of the exhaust-steam, and which increases with the degree of expansion. Compression, however, involves no loss of efficiency; for, as by compression a quantity of steam is incidentally reserved, and raised to a higher pressure, it gives out the power so expended in compressing it, during the next steam-stroke, just as a compressed spring would do in the recoil. But, apart from this general argument, the actual efficiency of the steam in the cylinder, with and without compression, may be exactly estimated. The most direct method of doing so, is to find the quantity of water consumed as steam for one stroke, under the two conditions, and to compare them with the relative effective mean pressures. As an example, the author analyzed the high-speed diagram exhibited to the meeting,—measuring the volume of steam admitted by the product of the area of piston (254·47 inches), and the period of admission, plus the total clearance in the cylinder and steam-passage. The clearance being measured for simplicity in inches of stroke, we have $7 + 1{\cdot}8 = 8{\cdot}8$ inches, for the total volume admitted. The pressure of the steam, when cut off, is 65 lbs., for which the relative volume of water is 359. Therefore the volume of water as steam, or the water-equivalent of the steam admitted, is

$$\frac{254{\cdot}47 \times 8{\cdot}8}{359} = 6{\cdot}24 \text{ cubic inches.}$$

From this is to be deducted the quantity of steam reserved by compression: the volume so reserved is measured by the period of compression, plus the clearance $(7{\cdot}5 + 1{\cdot}8 = 9{\cdot}3)$; and the pressure at the point of compression is 8 lbs., for which the

relative volume is 1125. Then the water equivalent of the reserved steam is—

$$\frac{254{\cdot}47 \times 9{\cdot}3}{1125} = 2{\cdot}10 \text{ cubic inches};$$

subtracting, there remains $6{\cdot}24 - 2{\cdot}10 = 4{\cdot}14$ cubic inches of water as steam, actually expended for one stroke of the piston.

Were there to be no reservation of exhaust steam by foreclosing the exhaust-port, the whole area of resistance by compression would be removed, and there would be a reserve of steam of atmospheric pressure equal in volume to the clearance only. The relative volume of atmospheric steam is 1669, and the water-equivalent of the reserve would be—

$$\frac{254{\cdot}47 \times 1{\cdot}8}{1669} = 0{\cdot}27 \text{ cubic inches}:$$

the expenditure per stroke would be $6{\cdot}24 - 0{\cdot}27 = 5{\cdot}97$ inches of water.

Now, the positive mean pressure during the steam-stroke, as indicated, is	40·9 lbs. per inch.
And the mean resistance by compression is ..	11·5 lbs. „
Thus the effective mean pressure is	29·4 lbs. „

This effective mean pressure of 29·4 lbs. is maintained by a consumption of 4·14 inches of water per stroke; and it has just been found that, with the compression removed, the positive mean pressure of 40·9 lbs. per inch would be maintained by a consumption of 5·97 inches of water per stroke. The effective pressure created per cubic inch of water is, therefore,

In actual practice .... $\frac{29{\cdot}4}{4{\cdot}14} = 7{\cdot}1$ lbs.

And would be by removing compression $\frac{40{\cdot}9}{5{\cdot}97} = 6{\cdot}9$ lbs.

These quantities are expressions of the relative efficiency of steam employed with and without compression: they are virtually identical, and shew that the resistance by compression in the cylinder, due to the action of the link-motion, does not in the slightest degree impair the efficiency of the steam.

The last objection to the use of the link, requiring notice, is that at *high speeds* considerable *back exhaust pressure* is created. The amount of this is very various, and it depends also on circumstances for which the link-motion is not responsible; such as a deficiency of inside lead, (which is regulated by the lap,) small ports, a small blast-orifice, and imperfect protection of the cylinder. It suffices, on the present occasion, to point out what can be done by superior arrangements, as exemplified in the diagrams from the "Great Britain." The cylinders of this engine are in a manner suspended in the smoke-box, and thoroughly protected; the steam-ways are very large, 13 × 2 inches, being in area about $\frac{1}{10}$th of the cylinder; the exhaust-passage is very direct;

and the blast-orifice is $5\frac{1}{4}$ inches diameter, or about $\frac{1}{11}$th of the area of cylinder. As a whole, these proportions are superior to those of any other engines with which the writer is acquainted; and the diagrams prove that the per-centages of back exhaust-pressure, in terms of the positive mean pressure, at 55 miles per hour, are—

For the 1st notch	....	$8\frac{3}{4}$ per cent.
„ 3rd ditto	....	$5\frac{3}{4}$ „
„ 5th ditto	....	nothing.

Better results than these should not in practice be required; for when locomotives are adapted to their work, and running at high speeds, they ought not to require an admission of steam above half-stroke. However, the area of blast-orifice rules the back exhaust-pressure; and when the cylinder is duly proportioned to the boiler, it is quite practicable, by a few modifications in detail, still further to increase the orifice sufficiently to banish all traces of back pressure of exhaust at all practicable speeds.

Having noticed the prevailing objections to the link, as a means of variable expansive working, and shewn that there is no good ground for entertaining these objections, the author proceeded to point out at what rate the efficiency of steam is increased by expansive working.

It is customary, he said, to apply the law of expansion discovered by Boyle, and better known as Marriotte's law, to determine the work done by steam acting expansively. In the present case, this mode of inquiry would be of little service,—for though steam in well-protected cylinders expands nearly according to Boyle's law, or such that the total volume by expansion varies inversely as the total pressure, yet the results are affected by other circumstances,—chiefly, the amount of clearance, wire-drawing, and back-pressure of exhaust and compression. It will be preferable to take the aggregate results of all these influences, as embodied in the model diagrams from the "Great Britain:"—this method will ensure accurate conclusions, and will simplify the discussion. Twenty-six indicator-diagrams were obtained, at speeds varying from 15 to 56 miles per hour, from which two samples were taken at the opposite extremes of speed, and a table was prepared and exhibited, containing an analysis of the results of these diagrams.

Referring to the contents of the last two columns of this table, the author said, it is obvious that the consumption of water as steam, or of coke, for a given amount of work done, becomes less the more expansively the steam is worked; and the means of the several quantities for the notches separately are as follow:—

CONSUMPTION PER HORSE-POWER PER HOUR.

For the 1st notch,	28·3 lbs. water,	or	3·54 lbs. coke.
„ 3rd „	24·3 „	„	3·03 „
„ 5th „	20·1 „	„	2·51 „

As the results under each notch vary very little, the means above stated may be adopted for all practical speeds without material error. To find, from these means, a formula which shall express the rate of economy by expansive working: it may be done graphically thus:—Draw a base-line AB, to represent the stroke of the piston. Set off on this base-line the distances AE, AF, and AG, equal respectively to the periods of admission under the 1st, 3rd, and 5th notches. From the points E, F, G, draw perpendiculars, equal, respectively, to the pounds of water per horse-power per hour consumed under the different notches, by any convenient scale of pressure, and terminate them by points, as drawn. These points are found to range in a straight line, CD, which meets the vertical from A, at a height of 14 lbs. by the scale, and the vertical from B, at 36 lbs. The straightness of the line CD implies that the consumption decreases uniformly with the period of admission of the steam; and the difference of heights, (36—14) or 22 lbs., is the whole decrease for the whole stroke. Consequently, if 22 be multiplied by the period of admission, and divided by the length of stroke, and 14 added to the quotient, the sum will express the consumption.

Let L = the length of stroke,
S = the period of admission of steam,
and W = the consumption of water in pounds per horse-power per hour;

then $$W = 22\,\frac{S}{L} + 14 \qquad (1.)$$

or, at length:—

RULE I.—*To find the consumption of water as steam per horse-power per hour, for a given period of admission.* Multiply the period of admission in inches by 22, and divide by the length of stroke in inches; and add 14 to the quotient. The sum is the required consumption in pounds.

For the *consumption of coke*—allowing 1 lb. for the evaporation of 8 lbs. of water—divide the water, as above found, by 8; and, making C the consumption of coke, we have

$$C = 2{\cdot}75\,\frac{S}{L} + 1{\cdot}75 \qquad (2.)$$

or, at length:—

RULE II.—*To find the consumption of coke per horse-power per hour, for a given period of admission.* Multiply the period of admission in inches by 2·75, and divide by the length of stroke in inches, and add 1·75 to the quotient. The sum is the consumption in pounds per horse-power per hour.

These rules may be employed, with safety, for all periods of admission between 10 and 75 per cent. of the stroke, which are the utmost limits worth regarding in the locomotive engine. They are applicable, also, for maximum pressures during admission, ranging between 60 lbs. and 120 lbs., though based on

results from steam of 80 lbs. to 84 lbs. maximum pressure. For extreme pressures, the results, by the rule, are slightly too small in the case of lower pressures, and rather greater for the higher; these divergences being due to the constant deduction of 15 lbs. for atmospheric resistance from the total pressure. It is presumed that engineers will not return to the error of low pressures in locomotives, and that high pressures will be cultivated. For pressures above 80 lbs., the rules are perfectly safe, as they err rather by excess on the safe side.

The author also exhibited a table shewing the efficiency of steam by expansion in the cylinder of the locomotive, in actual practice—for maximum pressures, during admission, of 60 lbs. to 120 lbs.; from which it appeared that the relative efficiency of steam, when cut off at $\frac{1}{10}$th of the stroke, is $2\frac{1}{4}$ times greater than when not cut off until the end of the stroke; but that, theoretically, the increase should be $3\frac{1}{3}$ times instead of only $2\frac{1}{4}$;—therefore the actual efficiency of steam increases with expansive working at a much slower rate than would be possible if every drawback were extinguished. Atmospheric resistance cannot as yet be removed; but a material advantage would result from a reduction of the clearance between the valve and the piston.

As 75 per cent. is the greatest admission materially required under the link-motion, the relative efficiency for that admission, (1·18), being compared with the efficiency (2·22) for 10 per cent. of admission, they are as 1 to 1·9, or nearly 1 to 2; and it follows that, under the most favorable existing circumstances, the utmost possible efficiency of steam worked expansively in locomotive engines by the link-motion, is about twice that of the steam when worked under full-gear: that is, the same quantity of steam does twice the quantity of work.

RULE 3.—*To find the effective mean pressure in the cylinder, in terms of the maximum pressure, for a given per-centage of admission.* Multiply the square root of the per-centage of admission by 13·5, and subtract 28 from the product: the remainder is the effective mean pressure in per-centage of the maximum pressure of steam admitted.

The results by this rule are rather too small for lower speeds, and rather too great for higher; but the deviations are of no practical moment. At 40 miles per hour, or 560 feet of piston per minute for the "Great Britain," the result exactly coincides with practice; and this is an ordinary speed of piston in both goods and passenger engines; as, though the usual speed of the former on the rails is less than that of the latter, the wheel is smaller, and the stroke is commonly longer. The rule applies very well to admissions between 10 and 75 per cent., and to pressures (maximum) from 60 lbs. to 100 lbs., or even 150 lbs.

The proportions of the "Great Britain" may be applied to any other engine; and they may be repeated here as standard ratios for practice, until superior results are obtained.

Sectional area of cylinder 1
„ steam-port 1-10th
„ blast-orifice 1-11th
Lap of valve, 1¼ inch.
Travel, 4¾ inch, in full-gear.
Lead, ¼ to ⅜ inch.

So wide a blast-orifice as $\frac{1}{11}$th is a rare thing in locomotives; but the writer is satisfied that, even in engines of very unfavorable proportions otherwise, a very wide orifice may be obtained by the proper adjustment of matters of detail.

In a second paper, the writer proposes to discuss the *conditions* necessary for the successful expansion working of steam in locomotives.

The following is a comparison of the actual results of engines working with ordinary *gab-motions*, and with *link-motions*.

The engine "Europe," on the Edinburgh and Glasgow Railway,—cylinder 16 × 18 inches, wheel 6 feet,—doing one week's work, in 1849, with gab-motion, consumed an average of 19 cwt. of coke per day, and 2 cwt. of coal. As, in the locomotive boiler, coal is about two-thirds of the value of coke, 2 cwt. of coal is equivalent to 1·33 cwt. coke; and the consumption per day may be stated at 20·33 cwt. coke.

The same engine, fitted with link-motion, used at the same season in 1851, and doing the same work, 12 cwt. of coke and 3 cwt. of coal daily,—equivalent to 14 cwt. coke. Over a run of 94 miles, the expenditure becomes—

24·22 lbs. per mile with gab-motion
16·70 „ „ link-motion

7·50 lbs. reduction, or 30 per cent. with link.

The periods of admission in the two cases would be about 70 and 45 per cent., and the consumption would be as 1·50 to 1·23, shewing an economy of only 18 per cent., or barely two-thirds of what was actually made. The greater actual efficiency must, in great part, be due to the superior opportunity of working with high pressure during the admissions afforded by the link.

Mr. McConnell considered the practical investigation of the subject given in the paper was very valuable. He agreed that the link-motion was the most advantageous and useful of any valve-motions known for locomotive engines; and the mode of hanging the link from a fixed centre, adopted by Mr. Gooch in the Great Western engines, had the advantage of preventing the increase of lead that took place in the ordinary link-motion when working with much expansion. He considered that the surcharging of the steam in the smoke-box was a valuable suggestion, and might very probably admit of being carried out so as to effect an important economy. And he thought that a hot-air chamber should be contrived, passing round the cylinder, and kept con-

stantly in such a temperature as to prevent any condensation of steam during expansion, and ensure the steam being always maintained perfectly dry, without any water being ever present in the cylinder from condensation or priming. The suspending the cylinders in the smoke-box was a good plan in the Great Western engines; but a special arrangement was required for the purpose of thoroughly carrying out the principle in a proper manner.

Mr. Clark said, that, in the engines referred to, Mr. Gooch had carried the steam-pipe straight down in front of the tubes, instead of curving it on one side as usual; and the pipe being made of one-eighth inch copper, the heat from the tubes was rapidly communicated through it, and the steam became much heated. In the experiments with the "Great Britain" engine, it had been found that there was considerably less difference between the pressure of the steam in the boiler and that in the cylinder, than was the case in other engines where the steam did not get so much heated; and Mr. Gooch had found in repeated experiments, very carefully tried, that the pressure was actually a little higher in the steam-chest than in the boiler,—the difference being greater at a higher speed, and amounting to as much as 7 to 10 lbs. per inch in some cases,—the pressure in the cylinder being equal to that in the boiler, and in some cases 2 or 3 lbs. above, instead of being considerably below, as was the case in most engines in regular work. He could only suppose that the elastic force of the steam was increased by its becoming surcharged with heat in the smoke-box after leaving the boiler; but could not account for a greater pressure being apparently maintained in the steam-chest, whilst the steam was flowing into it from the boiler.

Mr. Slate could not see how a greater pressure could exist in the steam-chest than in the boiler; as the steam would in that case flow back to the boiler till the pressure was equalized.

The Chairman observed, that, with regard to the question of surcharging steam, he remembered being told by Mr. Trevithick of an experiment which he made in Cornwall in 1830. He had to repair an old engine there, which had no steam-jacket to the cylinder, as most of the other engines had, to keep up the pressure of the steam; and he built a brick-casing round the cylinder, leaving an air-space all round, and applied a small fire to keep this air heated. About one bushel of coals in twenty-four hours was consumed in heating the cylinder; and he found a great increase was effected in the duty performed by the engine, with the same consumption of fuel under the boiler as before. He then removed the fire from the cylinder, in order to find the relative efficiency of the coal when consumed under the boiler or under the cylinder; and he found that it took five bushels of coals applied to the boiler to produce the same effect as the one bushel of coals applied to the cylinder. He (the Chairman)

had been so much impressed with the results of this experiment, that in the Planet, one of the early locomotives made in 1832, he had the cylinders carefully enclosed inside the smoke-box, instead of being outside, and there was found to be a considerable increase of power effected by the plan. That was the first locomotive constructed with heated cylinders, and it appeared the principle ought never to have been deserted; but it was singular how temporary prejudices sometimes caused a good thing to be departed from. Those inside cylinders were abandoned because the crank axles were found liable to break; but then, after that objection was subsequently removed by improved manufacture, the prejudice against the inside cylinders still remained: however, they appeared now to be going back to them. The construction of locomotives was still, perhaps, much influenced by these local prejudices arising from individual circumstances; and he was confident that this Institution would conduce greatly to the removal of them, by the mutual interchange of ideas and experience that was promoted by it; and nothing could assist more in forwarding such a desirable object, than the reading of such papers as the present one, by Mr. Clark.

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th May to the* 17*th June,* 1852, *inclusive.*

To Julian Bernard, now of Guildford-street, Russell-square, but late of Green-street, Grosvenor-square, both in the county of Middlesex, Gent., for improvements in the manufacture of leather or dressed skins, of the materials to be used in lieu thereof, of boots and shoes, and in materials, machinery, and apparatus connected with or to be employed in such manufactures.—Sealed 25th May.

Stewart McGlashen, of Edinburgh, Scotland, sculptor, for the application of certain mechanical powers to lifting, removing, and preserving trees, houses, and other bodies.—Sealed 26th May.

Jean Theodore Coupier and Maria Amedee Charles Mellier, both late residing at Maidstone, in the county of Kent, but at present of Golden Bridge Mills, near the City of Dublin, Gentlemen, for certain improvements in the manufacture of paper. —Sealed 2nd June.

Peter Fairbairn, of Leeds, in the county of York, machinist, and Peter Swires Horsman, of Leeds aforesaid, flax spinner, for certain improvements in the process of preparing flax and hemp for the purpose of heckling, and also machinery for

heckling flax, hemp, China grass, and other vegetable fibrous substances.—Sealed 3rd June.

William Hindman, of Manchester, in the county of Lancaster, Gent., and John Warhurst, of Newton Heath, near Manchester, cotton dealer, for certain improvements in the method of generating or producing steam, and in the machinery or apparatus connected therewith.—Sealed 3rd June.

Richard Archibald Brooman, of 166, Fleet-street, for improvements in presses, and pressing, in centrifugal machinery, and in apparatus connected therewith; part or parts of which are applicable to various useful purposes,—being a communication. Sealed 3rd June.

Richard Archibald Brooman, of 166, Fleet-street, for certain improvements in the preparation and treatment of fibrous and membranous materials, both in the raw and manufactured state; in applying electro-chemical action to manufacturing purposes; and in the manufacture of saline and metallic compounds,—being a communication. Sealed 4th June.

William Cardwell McBride, of Alistragh, county of Armagh, farmer, for certain improvements in machinery for scutching or otherwise preparing flax and other like fibrous materials.—Sealed 4th June.

William Watt, of Glasgow, in the county of Lanark, North Britain, manufacturing chemist, for improvements in the treatment and preparation of flax or other fibrous substances, and the application of some of the products to certain purposes.—Sealed 15th June.

List of Patents

Granted for SCOTLAND, from the 22nd April to the 22nd June, 1852.

To John Harcourt Brown, of Aberdeen, and John Macintosh, of the same place, for improvements in the manufacture of paper, and articles of paper.—Sealed 24th May.

Charles James Pownall, of Addison-road, London, for improvements in the preparation and treatment of flax, and other fibrous vegetable substances.—Sealed 28th May.

John Weems, of Johnstone, Renfrewshire, tinsmith, for improvements in the manufacture or production of metallic pipes and sheets.—Sealed 31st May.

Alexander Johnston Warden, of Dundee, manufacturer, for improvements in the manufacture of certain descriptions of carpets.—Sealed 31st May.

Joseph Swan, of Glasgow, engraver, for improvements in the production of figured surfaces, and in printing, and in the machinery or apparatus used therein.—Sealed 10th June.

George Searby, of Chelsea, London, decorator, for certain improvements in apparatus for cutting and carving metal, stone, and other substances,—being a communication.—Sealed 11th June.

John Frearson, of Birmingham, for improvements in cutting, shaping, and pressing metal, and other materials.—Sealed 14th June.

Thomas Twells, of Nottingham, manufacturer, for certain improvements in the manufacture of looped fabrics.—Sealed 14th June.

Andrew Fulton, of Glasgow, hatter, for improvements in hats, and other coverings of the head.—Sealed 14th June.

William Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in machinery for weaving, coloring, and marking fabrics,—being a communication.—Sealed 15th June.

James Edward Coleman, of Porchester House, Bayswater, London, for improvements in materials and apparatus to be employed in parts of railways; of engines and of carriages; and in the application of such materials to those purposes, and to the manufacture of textile and other mechanism,—being a communication.—Sealed 16th June.

William Hindman, of Manchester, and John Warhurst, of Newton Heath, near Manchester, cotton dealer, for certain improvements in the method of generating or producing steam, and in the machinery or apparatus connected therewith.—Sealed 16th June.

Richard Archibald Brooman, of Fleet-street, London, for a reaping machine,—being a communication. Sealed 17th June.

William Gratrix, of Salford, dyer and printer, for certain improvements in the production of designs upon cotton and other fabrics.—Sealed 17th June.

James Edward McConnell, of Wolverton, civil engineer, for improvements in steam-engines, in boilers, and other vessels for containing fluids; in railways, and in materials and apparatus employed therein or connected therewith.—Sealed 18th June.

New Patents

SEALED IN ENGLAND.

1852.

To Adolphus Charles Von Herz, of Cecil-street, in the county of Middlesex, Esq., for improvements in treating, preparing, and preserving roots and plants; in extracting saccharine and other juices from roots and plants; in the treatment of such juices; and in the processes, machinery, and apparatus employed therein. Sealed 29th May—6 months for inrolment.

Frederick Miller, of Fenchurch-street, in the City of London, Gent., for improvements in apparatus for hatching eggs. Sealed 29th May—6 months for inrolment.

Joseph Lees, the younger, of Manchester, in the county Palatine of Lancaster, calico printer, for an improved system of preparing, cutting, and engraving rollers, to be used for printing woven and other fabrics; and improved machinery for printing and washing the same fabrics. Sealed 29th May—6 months for inrolment.

Alexander Bain, of Beevor Lodge, Hammersmith, Gent., for improvements in electric telegraphs, and in electric clocks and time-keepers, and in apparatus connected therewith. Sealed 29th May—6 months for inrolment.

William Septimus Losh, of Wreay Sykes, near Carlisle, Gent., for improvements in the purification of coal-gas. Sealed 29th May—6 months for inrolment.

Richard Ford Sturges, of Birmingham, manufacturer, for a certain new or improved ornamental fabric. Sealed 29th May—6 months for inrolment.

William Armand Gilbee, of South-street, Finsbury, in the county of Middlesex, patent agent, for certain improvements in machinery for cutting corks,—being a communication. Sealed 1st June—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in machinery for propelling vessels, and in apparatus to be used in connection therewith,—being a communication. Sealed 1st June—6 months for inrolment.

Thomas Willis, of Manchester, machine-maker, for certain improvements in machinery or apparatus for winding yarns or threads; and also improvements in looms for weaving. Sealed 1st June—6 months for inrolment.

William Henry Phillips, of Camberwell New Road, in the county of Surrey, engineer, for improvements in decorative illumination, and in applying light for other purposes. Sealed 1st June—6 months for inrolment.

Samuel Morris, of Stockport, in the county of Chester, boiler-maker, for certain improvements in steam-boilers. Sealed 3rd June—6 months for inrolment.

William Haughton, of Manchester, manager, in the employ of Richard Birley and Co., for improvements in machinery for spinning cotton and other fibrous substances. Sealed 5th June—6 months for inrolment.

Robert Hardman, of Bolton, in the county of Lancaster, mechanic, for improvements in looms for weaving. Sealed 5th June—6 monts for inrolment.

Laurent Machabee, of Avignon, in the Republic of France, sculptor, for an improved composition, applicable to the coating of wood,

metals, and other substances to be preserved from decay. Sealed 8th June—6 months for inrolment.

Edme Augustin Chameroy, of Paris, Republic of France, manufacturer, for certain improvements in steam-engines. Sealed 8th June—6 months for inrolment.

Enoch Townend, of Keighley, in the county of York, manager, for certain improvements in the manufacture of textile fabrics. Sealed 8th June—6 months for inrolment.

William Gratrix, of Salford, in the county of Lancaster, dyer and printer, for certain improvements in the production of designs upon cotton and other fabrics. Sealed 8th June—6 months for inrolment.

William Rettie, of Aberdeen, lamp manufacturer, for certain improvements in lamps and burners, in apparatus for ventilating apartments, and in the mode of working signal lamps. Sealed 8th June—6 months for inrolment.

Henry Houldsworth, of Manchester, cotton-spinner, for improvements in embroidering-machines, and in apparatus used in connection therewith. Sealed 10th June—6 months for inrolment.

Thomas Wilkes Lord, of Leeds, in the county of York, flax and tow machine-maker, for improvements in machinery for spinning, preparing, and heckling of flax, tow, hemp, cotton, and other fibrous substances; and for the lubrication of the same and other machinery,—being a communication. Sealed 10th June—6 months for inrolment.

William Beasley, of Oak Farm Works, Kingswinford, in the county of Stafford, tube manufacturer, for certain improvements in the manufacture of metal tubes and solid forms, and in apparatus and machinery to be employed therein. Sealed 10th June—6 months for inrolment.

Michael Joseph John Donlan, of Rugely, Staffordshire, Gent., for improvements in treating the seeds of flax and hemp, and also in the treatment and preparation of flax and hemp for dressing. Sealed 10th June—6 months for inrolment.

Edwyn John Jeffery Dixon, of the Royal Slate Quarries, Bangor, and Arthur John Dodson, of the city of Bangor, Gent., for improvements in machinery and apparatus used in quarrying slate and stone; and in cutting, dressing, planing, framing, and otherwise working and treating slate and stone; and in apparatus and waggons used for moving and conveying slate and stone; and improvements in joining, framing, and connecting slate and stone. Sealed 12th June—6 months for inrolment.

William Reid, of University-street, electric telegraph engineer, and Thomas Watkins Benjamin Brett, of Hanover-square, Gent., for improvem nts in electric telegraphs. Sealed 12th June—6 months for inrolment.

Jean Ernest Beauvalet, Gent., of Paris, for improvements in the manufacture of iron and steel,—being a communication. Sealed 12th June—6 months for inrolment.

Joseph Brandeis, of Great Tower-street, in the City of London, for improvements in the manufacture of raw and refined sugar. Sealed 12th June—6 months for inrolment.

George Pate Cooper, of Suffolk-street, Pall Mall East, tailor, for certain improvements in fastenings for garments. Sealed 12th June—6 months for inrolment.

Thomas Restell, of Kennington, in the county of Surrey, watch manufacturer, for certain improvements in the construction of lamps and burners. Sealed 17th June—6 months for inrolment.

James Norton, of Ludgate-hill, in the City of London, merchant, for improvements in apparatus for ascertaining and registering the mileage run by public vehicles during a given period; also the number of persons who have entered in or upon, or are travelling in public vehicles; part of which improvements is applicable to public buildings and other places where tolls are taken. Sealed 17th June—6 months for inrolment.

William Cardwell Mc Bride, of Alistragh, county Armagh, farmer, for certain improvements in machinery for scutching or otherwise preparing flax and other like fibrous materials. Sealed 18th June—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of Fleet-street, in the City of London, for improvements in the manufacture of wheels, tyres, and hoops,—being a communication. Sealed 18th June—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of fences,—being a communication. Sealed 19th June—6 months for inrolment.

William Burgess, of Newgate-street, gutta-percha merchant, for improvements in the manufacture of gutta-percha tubing. Sealed 21st June—6 months for inrolment.

Jean Baptiste Georges Laudet, of Paris, civil engineer, for certain improvements in locomotive engines; part of which improvements are also applicable to other engines. Sealed 24th June—6 months for inrolment.

Claude Arnoux, of Paris, Gent., for certain improvements in the construction of railway carriages. Sealed 24th June—6 months for inrolment.

Alexander Johnston Warden, of Dundee, in the county of Forfar, manufacturer, for improvements in the manufacture of certain descriptions of carpets. Sealed 24th June—6 months for inrolment.

James Higgin, of Manchester, manufacturing chemist, for certain improvements in bleaching and scouring woven and textile fabrics and yarns. Sealed 24th June—6 months for inrolment.

Joseph Swan, of Glasgow, N.B., engraver, for improvements in the production of figured surfaces, and in printing, and in the machinery or apparatus used therein. Sealed 24th June—6 months for inrolment.

George Pearson Renshaw, of the Park, Nottingham, civil engineer, for improvements in cutting and shaping. Sealed 24th June—6 months for inrolment.

James Edward McConnell, of Wolverton, in the county of Bucks, civil engineer, for improvements in steam-engines, in boilers, and other vessels for containing fluids; in railways, and in materials and apparatus employed therein, or connected therewith. Sealed 24th June—6 months for inrolment.

Joseph Hart Mortimer, of Hill-street, Peckham, in the county of Surrey, for improvements in lamps. Sealed 24th June—6 months for inrolment.

Samuel Lusty, of Birmingham, for improvements in manufacturing wire into woven fabrics and pins. Sealed 24th June—6 months for inrolment.

Thomas Bell, of Don Alkali Works, South Shields, for improvements in the manufacture of sulphuric acid. Sealed 24th June—6 months for inrolment.

Joseph Morgan, of Manchester, patent candle machine manufacturer, and Peter Gaskell, of the same place, Gent., for improvements in the manufacture of candles. Sealed 24th June —6 months for inrolment.

Charles James Wallis, of Clarendon Chambers, Hand-court, Holborn, in the county of Middlesex, civil engineer and mechanical draughtsman, for improvements in machinery for crushing, pulverizing, and grinding stone, quartz, and other substances, —being a communication. Sealed 24th June—6 months for inrolment.

Thomas Bazley, of Manchester, cotton-spinner, for improvements in machinery for combing cotton, flax, silk, and other fibrous materials. Sealed 24th June—6 months for inrolment.

John Mc Conochie, of Liverpool, engineer, for improvements in locomotive and other steam-engines and boilers, in railways, railway carriages and their appurtenances; also in machinery and apparatus for producing part or parts of such improvements. Sealed 24th June—6 months for inrolment.

Thomas Allan, of the city of Edinburgh, engineer, for improvements in producing and applying electricity, and in apparatus employed therein. Sealed 24th June—6 months for inrolment.

CELESTIAL PHENOMENA FOR JULY, 1852.

D.	H.	M.	
1			Clock before the ☉ 3m. 31s.
	—		☽ rises 8h. 29m. A.
	—		☽ pass mer. morn.
	—		☽ sets 3h. 23m. M.
	—		☽ eclipsed, invis. at Greenwich
	3	28	Ecliptic oppo. or ○ full moon
	11	45	♃'s third sat. will im.
	20	35	☉ in Apogee
2	8	29	♃'s first sat. will em.
3			Occul. 27 Capricornii, im. 11h. 52m. em. 12h. 57m.
4			Occul. 29 Aquarii, im. 12h. 8m. em. 13h. 16m.
5			Clock before the ☉ 4m. 15s.
	—		☽ rises 10h. 55m. A.
	—		☽ pass mer. 3h. 5m. M.
	—		☽ sets 7h. 48m. M.
	9	3	☿ greatest hel. lat. N.
7	10	16	♃'s second sat. will em.
8	3	55	♃'s first sat. will em.
9	7		☽ in Apogee
9	8	6	☽ in □ or last quarter
	10	23	♃'s first sat. will em.
	23	12	☿ in conj. with Pallas, diff. of dec 18. 31. N.
10			Clock before the ☉ 5m. 1s.
	—		☽ rises 0h. 5m. M.
	—		☽ pass mer. 6h. 39m. M.
	—		☽ sets 1h. 26m. A.
	10	20	♃ stationary
	11	20	♅ in conj. with the ☽ diff. of dec. 4. 24. N.
	23	32	☿ in conj. with ♀ diff. of dec. 5. 44. N.
11			Vesta greatest Hel. Lat. S.
	4	43	♄ in conj. with the ☽ diff. of dec. 2. 0. N.
12	8	45	♀ in conj. with Pallas, diff. of dec. 12. 9. S.
15			Ceres in Perihelion.
	—		Mercury, R. A., 8h. 52m. dec. 19. 14. N.
	—		Venus, R. A., 8h. 13m. dec. 15. 6. N.
	—		Mars, R. A., 11h. 21m. dec. 4. 56. N.
	—		Vesta, R. A., 2h. 32m. dec. 7. 39. N.

D.	H.	M.	
15			Juno, R. A., 0h. 11m. dec. 4. 45. N.
	—		Pallas, R. A., 8h. 25m. dec. 3. 13. N.
	—		Ceres, R.A., 9h.30m.dec.22.23.N.
	—		Jupiter, R. A., 14h. 44m. dec. 14. 53. S.
	—		Saturn, R. A., 2h. 57m. dec. 14. 29. N.
	—		Uranus, R. A., 2h. 23m. dec. 13. 47. N.
	—		Mercury pass mer. 1h. 18m.
	—		Venus pass mer. 0h. 39m.
	—		Mars pass mer. 3h. 47m.
	—		Jupiter pass mer. 7h. 9m.
	—		Saturn pass mer. 19h. 20m.
	—		Uranus pass mer. 18h. 46m.
17	0	51	♀ in conj. with the ☽ diff. of dec. 7. 14. S.
	4	15	Ecliptic oppo. or ● new moon
18	4	14	☿ in conj. with the ☽ diff. of dec. 1. 54. S.
20			Clock before the ☉ 6m. 2s.
	—		☽ rises 7h. 51m. M.
	—		☽ pass mer. 3h. 9m. A.
	—		☽ sets 10h. 11m. A.
	16	51	♂ in conj. with the ☽ diff. of dec. 4. 46. S.
	21	0	♀ in inf. conj. with the ☉
22	6		☽ in Perigee
23	7	23	☿ in conj. with Ceres, diff. of dec. 6. 53. S.
24	1	2	☽ in □ or first quarter
	8	14	♃ in conj. with the ☽ diff. of dec. 3. 29. S.
25			Clock before the ☉ 6m. 12s.
	—		☽ rises 2h. 36m. A.
	—		☽ pass mer. 7h. 24m. A.
	—		☽ sets morn.
27	15	8	♀ in Aphelion
28	20	46	☿ in the descending node
30			Occul. 17 Capricorni, im. 10h. 16m., em. 11h. 34m.
	—		Clock before the ☉ 6m. 6s.
	—		☽ rises 7h. 57m.
	—		☽ pass mer. morn.
	—		☽ sets 3h. 9m. M.
31	2	5	♅ in □ with the ☉
	2	12	Ecliptic oppo. or ○ full moon

J. LEWTHWAITE, Rotherhithe.

THE

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No. CCXLVIII.

RECENT PATENTS.

To ROBERT WILLIAM SIEVIER, *of Upper Holloway, in the county of Middlesex, Gent., for improvements in weaving and printing or staining textile goods or fabrics.*—[Sealed 21st January, 1851.]

THIS invention relates, first, to a novel arrangement of parts, whereby the surface of either looped or cut-pile fabrics, such as velvets, Brussels or velvet-pile carpets, or tapestry, is produced from the weft or shoot, instead of from the warp, as is usually the case where a long looped fabric is made.

In carrying out this improvement two warps are employed, one called the binder-warp and the other the back-warp, as the latter is employed for forming the back of the fabric. The looped surface is produced by causing the weft to traverse across, and be looped over a series of terry wires, arranged parallel with the warp-threads; and which wires may be made either with plain ends, when a terry or uncut loop is required, as in Brussels carpets or terry velvet; or with a contrivance at the end for receiving the cutting edges of a series of knives, or other suitable instruments, if a cut-pile fabric is intended to be produced.

In Plate IV., fig. 1, is a front elevation of the principal parts of a loom, constructed according to this invention; and fig. 2, is a vertical section thereof. *a*, is the framework of the loom; *b*, is the binder, and *b**, the back-warp-beam; *c*, is the breast or take-off-beam; *c**, the work-roller; *d*, the lay-sword; *e*, the lay of the batten; and *e**, *e**, are the shuttle-boxes, which must be made double if they are intended

to contain two shuttles,—one to carry a weft to make the body of the fabric, and the other to carry the woollen or silk weft to form the surface of the fabric,—or one shuttle may be used, if the weft for the body of the fabric and the surface are the same. The terry wires, over which the loops are made from the woollen or silken shoot or weft, are seen at *f*. They are mounted at one end on a rod, at the upper extremity of the arms or levers *g*, (see fig. 2, and the detached view, fig. 3,); and if a cut-pile is required, it will be found necessary, in order that the wires may be held in their proper places, that the opposite ends also of these wires should be strung on a thin rod: this, however, will not be necessary when a terry or uncut or looped fabric, like Brussels carpet or terry velvet, is required. The binder-warp b^1, does not pass through heddles or harness, but merely through loops or mails in the strings *h, h*, which are connected at one end to the levers *i, i*, above, and at the opposite or lower end to levers, which are furnished with springs to keep them steady and prevent them from jumping. The back-warp *b***, passes through, and is worked by, harness or heddles *h**, in the usual manner: the longitudinal wires *f, f*, are also passed through the mails of the harness or heddles *i**, whereby the wires are drawn up when required. The back or body of the fabric is made in the usual manner, by means of the warps b^1, and *b***, together with the linen or other wefts. Previous to throwing the shuttle that contains the woollen, silk, or other weft, which is intended to form the loop on the surface of the fabric, the binder-warp b^1, must be drawn up, to allow the surface or loop weft to pass under it and over the top of the longitudinal wires *f,f*. In order to form the loops from the woollen, silk, or other weft, the binder-warp must be then drawn down; but this must be done in a peculiar manner, so that the weft may be gradually drawn off the shuttle as the loops are made. This is effected by the following mechanical arrangement of parts:—It has been said that the strings *h, h*, which work the binder-warp b^1, are attached to the outer ends of the levers *i, i*, above. The tails or inner ends of these levers are acted upon by a cam-drum *j*, which, at certain parts, is cut in steps, as seen best at 1, 1, in fig. 1. As the drum *j*, rotates, its larger circumference (as at fig. 2,) will act against the tails of the levers *i, i*, and, raising their outer ends (as shewn by dots in fig. 2,), will thereby draw up the warp, b^1, so as to allow the shuttle to pass under the same; then, the shuttle having been thrown, the drum *j*, will be again made to rotate a considerable portion of a revolution, and, by means of the steps

1, 1, the levers *i, i,* will be allowed to descend one after the other; and each separate warp-thread will, as it descends between the horizontal wires *f, f,* draw from the shuttle a sufficient quantity of weft to form the loops one after the other, but in very rapid succession. The downward motion of the warp-threads *b*, to form the loops in this manner, is assisted materially by the springs and levers, to the lower ends of which the strings *h, h,* are attached; as, immediately the levers *i, i,* above are released by the smaller diameter of the cam-drum coming round, the levers below will be forced down by their springs, and will draw down the warp-threads b^1, and form the loop by drawing the required quantity of weft off the shuttle. It should be understood that the formation of the loops, by the descent of the warp-threads b^1, commences at that side of the loom from which the shuttle has just been thrown. It will be seen, on referring to fig. 1, that there is a similar arrangement of steps in the opposite side of the cam-drum *j*; so that the same action of the levers *i, i,* and warp-threads b^1, may take place when the shuttle is thrown in the opposite direction. Motion is communicated to the cam-drum *j*, by means of the toothed wheel *k*, which gears into a pinion or wheel *l*, on the axis of the cam-drum. On the shaft of the wheel *k*, is a ratchet-wheel *m*, worked by ratchets on the double lever *n*, which is connected by a rod *o*, to one end of a lever *p*, below; and there is a click, or catch *n**, to prevent the ratchet-wheel *m*, from turning in the wrong direction. This lever *p*, turns on a fulcrum at 3, and is furnished with a bowl or antifriction roller *q*, which works in the groove of a cam-wheel *r**. On the tappet-shaft *r*, there is a toothed wheel *s*, which is driven by another toothed wheel *t*, on the crank-shaft. As the wheel *s*, has six times the number of teeth of the other toothed wheel on the crank-shaft, it follows, that for every rotation of the crank-shaft, the wheel *s*, and consequently the cam *r**, will make one-sixth of a revolution. The bowl *q*, of the lever *p*, will be slightly depressed, and consequently will, by means of the rod *o*, and double ratchet-lever *n*, pull round (a short distance) the ratchet-wheel *m*, the wheel *k*, and pinion *l*, which has half the number of teeth of the wheel *k*. The effect of this will be that the part 2, of the cam-drum will act against and depress the tails of the levers *i, i,* and bring them into the position shewn by dots in fig. 2,—during which time the shuttle to make the loop is thrown. Owing to the peculiar form of the cam *r**, the lever *p*, will have fallen, and the double ratchet-lever *n*, will have assumed its original position; but, as the crank or driving-

shaft continues to revolve, the higher raised portion of the cam r^*, will come against the bowl q, of the lever p, and force the latter down a considerable distance; at which time, through the medium of the rod o, and double ratchet-lever n, the ratchet-wheel m, and the toothed wheel k, will be again caused to rotate and pull the pinion l, and the cam-drum j, nearly half round; and, by means of the steps 1, 1, on the periphery of the latter, the levers i, i, will be liberated, one after the other, in rapid succession, and thereby allow the warp-threads b^1, to descend between the wires f, f, and form the loop.

In forming two of the sheds (three being required to produce each loop) it will be necessary to raise the longitudinal wires f, f, with the back warp-threads b^{**}; and in this position they remain while the linen shoot is thrown twice under them. When the wires f, f, are required to be raised, as just mentioned, it will be found advisable to slacken them, so as to allow the same to be lifted without straining or drawing them out of their proper position. For this purpose the lever g, is mounted on a fulcrum, and is furnished at its lower end with a bowl or antifriction roller q^*, which acts in a groove in a cam u, on the same shaft as the cam r^*. The cam u, forces the upper end of the lever g, forward about a quarter of an inch, at the precise moment that the shed is being formed; and this slight movement of the lever g, enables the wires to be raised with the warp-threads without the liability of their being strained.

In order to cut the loops formed over the wires f, f, and thereby produce a cut-pile fabric, the outer ends of the wires are furnished with a groove 5, as shewn in the enlarged detached view, fig. 4. The knives or cutting instruments consist simply of plain discs of thin steel v, with sharp edges, mounted on a shaft w, and kept separated from each other by washers. The edges of the discs enter and work in the grooves 5, of the wires f, and are maintained therein by raised sides, as shewn best in the enlarged figures 5, and 6. The cutting operation is effected in the following manner:—A pin x, (see fig. 2,) attached to the sword-arm, is made, at every beat-up, to strike a spring-lever y, that carries at its lower end a pall or click, which takes into and drives a ratchet-wheel z, on the shaft w, of the cutting discs, the edges of which are in contact with the loops of the fabric; and as the discs, at every stroke of the batten, are caused to rotate a short distance, the loop will be cut as the fabric is drawn forward by the taking-up motion.

At fig. 7, a convenient method of sharpening the discs v, is

shewn. This operation is effected by means of a series of steel discs 7, with roughened sides like the face of a file: these discs 7, are mounted on a spindle, and are held stationary while the cutting discs or knives are made to rotate against their sides with considerable rapidity.

A diagram of the tie, to form the fabric, is shewn at fig. 8, and will be easily understood by any practical weaver. To form the first shed, No. 1, in the diagram, the binder-warp b^1, is drawn up, and the woollen or silk weft to form the loops is thrown; then the binder-warp goes down, and the back-warp b^{**}, and the wires *f*, *f*, are raised at the same time, and the linen or cotton shoot is thrown; the back-warp then goes down (the wires remaining up), and the binder-warp is raised, and the linen shoot thrown back again. The tie may be varied, and similar results obtained; and the patentee, therefore, does not intend to confine himself to this tie, nor does he claim it as forming any part of his invention.

The second part of the invention relates to an improved arrangement of apparatus for printing or staining textile goods or fabrics. The apparatus is represented (in longitudinal vertical section) at fig. 9, as applied for printing or staining warps; but a similar arrangement of apparatus may be employed for printing or staining a cloth or fabric, such as that produced in the loom above described, or any other textile cloth. *a*, *a*, are four beams, upon which the warps to be printed or stained are wound; but any other convenient number of warps, more or less, may be operated upon simultaneously: it is preferred, however, that not more than six warps should be stained at the same time. The warp-threads, as they are uncoiled from the beams, pass through reeds *b*, *b*, to separate and space them out properly; and from these reeds they pass under a frame *d*, *d*, in which are placed four or more perforated plates *c*, hereafter more particularly described. The threads of the four warp-beams, suitably combined, are conducted through a reed *e*, situated near one end of a printing table *f*. The perforated plates *c*, are, by preference, made of thin metal, such as copper or brass; but thin sheets of gutta-percha, or other impervious material, may be employed. These plates or sheets are secured by nails or pins to a wooden framing; and certain portions of them are perforated or cut away, according to the pattern intended to be produced. In the subsequent portion of this description only four plates are supposed to be used; and this number will be found sufficient for most patterns. In the first plate, all those parts which correspond to the first or light tints of all colors are cut in it,—

so that when it is brought on to the table *f*, and secured in its proper position on the top of the warp-threads, by means of the register pins *g*, *g*, the attendant has only to take a brush, with the proper color in it, and dab it on to the perforations. By means of this one plate the lightest shade of every color is first transferred or stained on the warp-threads,—the attendant being supplied with a number of pots of different colors for this purpose; and the pattern being also placed before the attendant or operator, as at *z*, in order to guide him. The second plate will be perforated at all parts corresponding to the next darkest tints. When the warps or fabric have been stained with all the first tints, the first plate is removed from the table, and replaced in its frame *d*, *d*; then the second plate, which is perforated at all parts corresponding to the next darkest tints, is brought on to the table in its place; and the second tints are transferred in a similar manner to the warp-threads or fabric. The third and fourth plates are used in the same manner. For the convenience of moving the plates *c*, *c*, from the frame *d*, they are furnished with small rollers or wheels, which run on the tables *d**, of the frame *d*, *d*. Eyes are also adapted to the upper side of the frames of the plates *c*, *c*, for the purpose of receiving hooks at the ends of the cords *h*, *h*, whereby the plates are raised or lowered on to the printing table; this operation being facilitated by the winch and barrel *i*.

The warp or fabric, when printed or stained with all the colors required, is drawn forward from off the printing table, and is passed through a drying-box *j*, which is heated by steam or hot water. By this means, that part of the warp or fabric which has just been printed, is dried, while a new portion is being operated upon at the printing table. In order to fix or set the colors, the warp or fabric is passed forward into another box or chest *k*, supplied with steam, in which it will remain while the operation of printing or staining another portion of the fabric is going on. In order, as far as possible, to prevent the escape of steam from the box *k*, the openings through which the warp or fabric passes into or out of the box *k*, are closed by plates or doors, furnished at their edges with some soft material, such as list or felt, whereby they may be packed when squeezed tight by means of the screws *x*, *x*, (see the enlarged view, fig. 10,); and every time the warp or fabric is required to be moved forward, the doors or plates must be removed by unscrewing the fastenings *x*, *x*. From this steam-chamber the warp or fabric passes over a roller, and descends

to a well or chamber *l*, in the floor beneath, where it may be collected ready for the next or washing operation.

The washing operation is carried on in the tank or well *m*, which is supplied with clean fresh water by a pipe *n*; and a number of washers or beaters are placed in the tank, for the purpose of washing out and removing all the gum, paste, and superfluous color, or other matters that have been used in the printing or staining operation. In order to remove the dirty water from the tank *m*, and keep up a continuous supply of fresh water, the fresh water is made to run in through the pipe *n*, and the dirty water is drawn off from the bottom by means of the pipe *o*. From the washing tank the warp or fabric passes between a pair of pinching-rollers *t*, whereby the superabundant moisture is squeezed out before the cleansed warp or fabric is allowed to pass into the drying-box *p*, which is heated by steam or hot water in a similar manner to the box *j*, above mentioned. When the warps have been dried by the heat in the box *p*, each is passed through a reed *v*, for the purpose of separating it from the other warps; and each warp is then wound on to its respective beam *q*, and is ready for weaving into a cloth or fabric. When a woven fabric, instead of four or more warps, is to be operated upon, the beams or rollers *a*, *a*, and the reeds *b*, *b*, and *e*, at the commencement, and also the reeds *v*, and beams *q*, *q*, are dispensed with,—the woven fabric being unwound from one roller at the beginning of the apparatus and wound on to another at the end.

The patentee claims, First,—forming the looped surface of a looped fabric, such as Brussels carpeting, terry velvets, and other similar goods or fabrics, from the weft, by means of longitudinal wires or other equivalent means, in combination with warp-threads, which, by being made to descend, one after the other, in rapid succession, instead of simultaneously, as is usually the case with warp-threads, will thereby draw off from the quill or bobbin in the shuttle a sufficient quantity of weft or shoot to form the loops, one after the other, over the terry wires. Second,—the method herein shewn and described, or any mere modification thereof, for cutting the loops when a cut-pile fabric is required. Third,—the general arrangement of the machinery or apparatus, shewn and described, for printing or staining warps or fabrics; and also the mode of printing or staining warps or fabrics, as described. He also claims particularly the use of plates, perforated to correspond with the different shades of the pattern, as described, whereby the operation of printing or staining warps or fabrics is much facilitated.—[*Inrolled July*, 1851.]

To GUSTAVE EUGENE MICHEL GERARD, *of Paris, in the Republic of France, for improvements in dissolving caoutchouc (India-rubber) and gutta-percha.*—[Sealed 7th May, 1850.]

THIS invention consists in certain improved means of dissolving India-rubber and gutta-percha.

The patentee commences his specification by remarking that heretofore all solutions of India-rubber, whether clear or thick, have possessed great coherence and elasticity,—the solvent, whatever it may have been, has always expanded the gum to a great extent; and as it is not until after this has taken place that the real act of dissolving the gum commences, a large quantity of the solvent is consequently required. To remedy these inconveniences, and to obtain a thick solution, the India-rubber has been expanded in the solvent and afterwards pressed by means of cylinders; but the solution thus produced possesses great cohesion and elasticity. Now it is stated that, by the patentee's process, he obtains caoutchouc or gutta-percha, or the two combined, in a state of solution, as thick and concentrated as may be required; and, however thick it may be, it loses its tenacity and elasticity, and will assume the form of paste after the evaporation of the solvent, and will retake all its former properties.

The new process consists in mixing with the solvent (of whatever nature it may be) a certain quantity of alcohol, and macerating therein the caoutchouc or gutta-percha, which will expand very little; and at the end of twenty-four hours it will be in the state of paste, suitable for being moulded into any desired form. The patentee prefers to employ as a solvent sulphuret of carbon, chloroform, sulphuric ether, naphtha, essential oils of coal, or turpentine, and to add thereto from five to fifty per cent. of alcohol. The caoutchouc is mixed with the alcoholized solvents in all proportions, varying from equal parts to thirty parts of the latter to one of the former, according to the thickness of the solution required; and, after one or two days, the paste is submitted to the ordinary process of masticating, if the solution is made of equal parts, or when it is made with small quantities of the solvents: in other cases this is not necessary. The patentee adopts the same system when treating gutta-percha. He dissolves it in the alcoholized sulphuret of carbon, and dilutes it until it arrives at the consistence of thick syrup of sugar; in this state he permits it to remain for three or four days, during which time the impurities will be precipitated or will rise to the surface; and

then he draws off the gutta-percha in a state of complete purity.

It will be seen that the character of the invention is the mixture of alcohol with the solvent used for dissolving caoutchouc and gutta-percha. As alcohol is the liquid which most quickly precipitates caoutchouc from its solutions, the patentee avails himself of this property by causing the alcohol, by means of a solvent, to enter into the interior parts of the caoutchouc, or to detach all the adherent atoms which form the mass of the caoutchouc. By the addition of the alcohol, the particles are rendered less adherent among themselves, and are easily separated by pressure,—retaining the form resulting from this pressure, and not returning to their ordinary form. On the solvent and the alcohol being evaporated, the caoutchouc will return to its original state. The patentee states, that all liquids which possess the properties of alcohol may be mixed with the solvents; but that it would be difficult to define all the liquids which would act according to his invention, for the purpose of precipitating caoutchouc from its solution; and he further says, "I should comprise all liquids which have not the property of dissolving the India-rubber, and which can be introduced into the gum by means of a solvent." In conclusion, he remarks, that the principle of his invention is the causing matters which are not of a solvent nature to be introduced into the body of the India-rubber, by means of a solvent,—such matters having the property to disunite the parts constituting the mass of India-rubber and destroy the adherence of the particles, whether these matters are combined with the solvents or introduced by themselves.—[*Inrolled October,* 1850.]

To WILLIAM EDWARD NEWTON, *of the Office for Patents,* 66, *Chancery-lane, in the county of Middlesex, civil engineer, for improvements applicable to boots, shoes, and other coverings for or appliances to the feet,—being a communication.*—[Sealed 6th June, 1850.]

THE first part of this invention consists in providing the under surface of India-rubber shoes, buskins, gaiters, boots, and overshoes, with projecting metallic points, permanently secured in or to the sole, so as to render the same less liable to slip or slide when used in walking over snow, ice, or other smooth or slippery surfaces.

In carrying out this improvement, the inventor procures

short metallic points, in the form of headed rivets, in length very slightly exceeding the thickness of the sole, having a head of any convenient size. The diameter of the head is not material, but it should be not less than an ordinary rivet-head; and the size of the projecting portion should be, for light shoes, about $\frac{1}{10}$th of an inch in diameter, which may be increased according to the size of the shoe,—care being taken not to render the weight of the shoe burdensome either by the size or number of the rivets or points. Before the sole is applied to the shoe these rivets or points are inserted through perforations in the sole, so that the heads shall rest upon the inner surface, and the points project through and beyond the outer surface, but so slightly that they can scarcely be felt in passing the hand over the surface. If suffered to project too far, the points would be liable to catch in walking upon a carpet, mat, or other similar surface.

The sole, thus prepared, is then applied, in the usual manner, to the shoe. To give increased strength and firmness, a piece of cloth, canvas, or India-rubber cloth, may be placed over the heads and cemented to the sole before applying the same to the shoe. The patentee remarks, that he uses the term "points," as distinguished from "heads,"—not intending thereby that the smaller part of the rivet shall be brought to an actual sharp point. This may be done or not; but, in general, it will be found to answer if the projecting portion of the rivet is of uniform size from the head to the end, as in the ordinary headed rivet, which is cut off at right angles or square; and, in the latter case, the end may be indented by crosswise indentations, to render the same more tenacious.

Another mode of providing the sole with such points differs from the foregoing in this respect only:—Instead of using a number of headed rivets, the patentee takes a metallic plate, with projecting points, which may readily be cast for the purpose; so that when the points are inserted in the sole, the projecting points on the outer surface will be similar to those in the sole prepared with rivets, as above described; while, on the inner surface, instead of presenting several heads, there will be one plate, which may be treated as one connecting head for all the rivets.

Another mode differs only from the last in having the plates prepared with large perforations between the projecting points, so as to present the appearance of open or basket-work, with the points projecting at the crossings.

Another mode differs from the foregoing only in this:—Whether a plate or rivets are used, instead of inserting the

points in the sole of the shoe, insert them in a piece of India-rubber (of smaller size) or other material, of thickness and strength sufficient to hold them firmly in their position; and attach the same, when so prepared, by means of the cement employed in the manufacture of the shoe, to the surface of the sole.

The patentee claims, under this head of the invention, the preparation of the sole or under surface of India-rubber shoes, buskins, gaiters, boots, and overshoes, by inserting therein or attaching thereto metallic points, permanently secured in or to such sole or under surface by the modes above-mentioned; and the application of metallic points, permanently secured to such sole or under surface, to the manufacture of India-rubber shoes, buskins, gaiters, boots, and overshoes, to prevent their wearing, and to make them less liable to slip or slide when used upon ice, snow, or other smooth or slippery surface.

The second part of the invention relates to what the inventor denominates foot-holders, which are to be put over shoes to prevent slipping; and it consists in taking a piece of sole, prepared according to the first part of the invention, and attaching it to a strap of vulcanized India-rubber, so that it can be readily slipped over the shoe or boot. The strip should be in length equal to the breadth of the ball of the foot, and about two inches wide; and it is to be secured to a strap of vulcanized India-rubber of sufficient length to pass over the foot when partly distended; so that, when slipped over the boot or shoe, the foot-holder shall be held in its place by the tension of the strap of India-rubber. Or the sole is made to extend from the toe to the hollow of the foot. At the point is attached a short strap, to fit over the toe of a boot or shoe; and to the hinder part is secured a strap of vulcanized India-rubber, which will extend around the heel.

What the patentee claims as new in this part of the invention is, the employment of a partial or entire sole, as described, in combination with an elastic strap, for the purpose of preventing the wearer from slipping on smooth surfaces.

The third part of the invention relates to a method of making that kind of shoes known as clogs, and consists in making them of India-rubber, or the compounds thereof, and of what the inventor denominates India-rubber sponge, moulded of the desired form, with the upper part of the sole, which comes in contact with the sole of the shoe or boot, formed with a ring all round, and protuberances, so as to give the desired elevation with little weight.

The operator mixes sugar or resin with the India-rubber,

prepared in the usual manner for vulcanizing, in the proportion of one quarter of a pound of sugar or resin to each pound of India-rubber; and, after the compound has been worked and treated in the usual manner, he forms the clog thereof in a mould, and subjects it to the curing or vulcanizing process, by which it is rendered spongy and light. The mould is so formed as to make the sole thin, with a rim all round, and protuberances within, for the boot or shoe to rest on, to give the foot the required elevation from the ground. The sole, thus prepared, can be provided with a toe-piece and heel-strap, as described under the second part of the invention; or it may be provided with any other means for securing it to the foot.

Another improvement in clogs relates to a means of constructing a thick but yet light sole, which may be conveniently used in either wet or dry weather. Instead of making the sole of the same thickness all over, which would make it heavy and clumsy, or with a rim or projecting rib all round the edge, which might be inconvenient in use, the inventor sometimes makes the sole thick in parts and thin in other parts within the rim, so that the surface of the sole shall be cellular, and intersected by ridges, like the surface of a "waffle-iron," so as to present square or round-shaped supports to the foot.

The patentee claims, under this part of the invention, making the soles of clogs of what he denominates India-rubber sponge, produced substantially as described; but he does not mean to confine himself to the use of sugar or resin, as other substances, which will evolve gas in large quantities during the curing process, will answer the same purpose, although he has found sugar or resin to answer best. He also claims making the soles of clogs, whether made of India-rubber sponge, or any other preparation of India-rubber, with a rim and protuberances on the upper surface, to elevate the foot from the ground without making the article of too great weight.

The last part of the invention relates to a mode or modes of making India-rubber shoes or coverings for the feet pervious to perspiration, and yet impervious, under ordinary circumstances, to water or damp. This object may be effected by taking a quantity of India-rubber sponge and rolling it into thin sheets, which sheets may be made into boots, shoes, or coverings for the feet; and as they will be found to be covered with a great number of very fine holes, they will allow the perspiration to pass through, but will effectually keep out the wet: it is preferred, however, to perforate the India-rubber by

mechanical means, as a greater amount of regularity may be thereby obtained, and the perforating process will be more under command. When the sheet rubber is made up into boots or coverings for the feet, it will be necessary either to leave those parts of the boot nearest to the sole, and most exposed to the wet, unperforated and impervious, or to cover those parts with an impervious material,—leaving only the upper part pervious to the perspiration.

Under this head of the invention the claim is for making boots, shoes, and other coverings for the feet, pervious to the perspiration of the wearer, by making such articles of sheet rubber, previously perforated with minute holes.—[*Inrolled December*, 1850.]

To Hugh Bowlsby Willson, *late of the York Hotel, Blackfriars, in the City of London, but now of Bloomsbury-square, in the county of Middlesex, Esq., for improvements in the construction of rails for railways,—being a communication.*—[Sealed 13th November, 1851.]

The object of this invention is to produce a compound rail, to be employed in the construction of the permanent way of railroads, whereby the advantages of stability and durability, which would result from the use of a continuous bar, will be more nearly approached (and that at little or no increase of expense) than by the plan hitherto adopted upon railways.

In order to effect this improvement, the rails are formed in two parts, which interlock into each other, or are prevented from shifting from their relative positions by means superadded to those of tightening screws, or other analogous contrivances for effecting the union of the two parts composing the rail. These bars (provided with rebates, or otherwise furnished with means to prevent them from moving independently of each other) are put together in such a manner as to break joint: that is, the abutting ends of the bars, forming one side of the rail, will never be in a line with the abutting ends of the bars forming the other side of the rail. The bars are constructed of rolled iron; and their upper edges, when the bars are connected together, as above indicated, form the bearing surface of the rail.

In Plate III., figs. 1, to 6, inclusive, represent several modifications of the compound rail, constructed so as to render chairs unnecessary for its support. This advantage is effected by extending the base of the rail on both sides, whereby a

large bearing surface is obtained; and by means of hook-headed spikes, driven into cross wooden sleepers, this construction of rail may be held firmly in its place. Figs. 1, 2, and 3, shew three different forms of solid rebated rails, with an extended base: that is solid, in contradistinction to the hollow rail to be presently noticed. These rails are composed of two bars of rolled iron A, B; and they are firmly connected together by screw-bolts or rivets C. It will be readily understood, that even if the bolts C, should be caused to work loose by the vibratory action to which the permanent way is continually subjected, yet, by reason of the rebates, one side or bar will not be able to sink, so long as the other maintains its proper position.

Figs. 4, 5, and 6, shew three forms of hollow rebated rails, which offer this advantage over the solid rails, viz.,—that a broader base, and consequently greater steadiness, may be obtained, with a saving in weight of metal.

Fig. 7, shews a mode of obtaining the benefit derivable from the rebate, without employing that mode of obtaining structural consistency in the rail.

This is effected by rolling the bars A, B, with a recess on their inner face, and inserting, at the parts where the screw-bolts or rivets C, connect the bars together, a metal filling-piece D, of such form that it will bear against the upper and lower lips of the recesses in the bars A, B, and form a sort of key, which will effectually prevent the bars from moving vertically independently of each other. In order to retain these metal filling-pieces in their places, it will be desirable to pass the screw-bolts C, through them, as shewn.

In laying down the improved rails, the patentee prefers to employ cross ties or sleepers, which, by giving some appreciable amount of elasticity to the structure, will prevent much wear and tear in the running stock; and he fixes the rails in their places by driving hook-headed spikes into the cross ties, on each side of the base of the rails, and at the points near where the ends of the bars abut, or where the break-joint junctions are made. It may be found desirable to make indents in the edge of the bars to receive these spikes, as the rails will thereby be prevented from working endwise.

Figs. 8, to 12, inclusive, shew the mode of constructing both solid and hollow rebated rails with double heads. In using this modified construction of break-joint, rail-chairs will be required for sustaining the rails in their place. They may therefore be readily substituted for those at present in use; and, in this respect, they will have the advantage over

those constructed with an extended base. In common with the ordinary construction of rail, they will admit of being turned over, to present a second bearing surface to the action of the rolling stock, when the efficiency of one surface has been destroyed by such action.

The patentee claims the constructions of compound break-joint rails for railways, as above set forth.—[*Inrolled May* 1852.]

To Daniel Dalton, *of Spon-lane, in the parish of West Bromwich, and county of Stafford, iron-founder, for improvements applicable to railroads.*—[Sealed 26th April, 1851.]

This invention is stated, by the patentee, to consist of various constructions and combinations of rails and longitudinal iron sleepers, to be laid end to end on the ballast, so as to form, in effect, firm continuous iron bearings and rails.

In Plate III., figs. 1, 2, 3, 4, 5, and 6, exhibit the various rails and sleepers in transverse section; and fig. 7, is a plan view of part of a railway constructed according to the arrangement represented in section at fig. 1. In all these figures *a, a,* are the rails; *b, b,* are the sleepers, which, when made of cast-iron, have lugs *c, c,* cast thereon (indicated by dotted circles in figs. 1, to 6,) to receive the wrought-iron bolts *d, d,* whereby the adjacent sleepers are secured to each other, and to the transverse tie-rods *e, e,* that connect them with the opposite or parallel line of sleepers; *e, e,* are the side supports for the rails; and *f, f,* are the keys for securing the rails in their places. In fig. 1, only one key is used, as one of the supports *e,* is cast so as to fit close to the side of the rail; and, in this case, such support may be extended throughout the length of the sleeper, if desired (as shewn in fig. 7), so as to form a continuous lateral support to one side of the rail; but when two keys are employed (as at fig. 4), the sleeper is provided with short side supports, similar to the jaws of ordinary chairs. In fig. 2, the support on one side is cast so as to fit close to the rail, and may be extended throughout the length of the sleeper, if desired; and this sleeper, with a slight variation, is suitable for a double-headed rail, as indicated by the dotted lines. In fig. 3, both the side supports may be continuous throughout the length of the sleepers, and the rail fastened thereto by bolts and nuts.

In figs. 1, 2, and 3, the rails are of wrought-iron and the

sleepers of cast-iron. In fig. 4, the rail is also made of wrought-iron and the sleeper of cast-iron; but, if preferred, the side supports may be formed separately, either of wrought or cast-iron, and secured to the sleeper (which, in this case, must be of wrought-iron) by bolts and nuts, as indicated by the dotted lines *g*; or the side supports may be dispensed with, and the rail and sleeper connected together by bolts and nuts in the manner represented by the dotted lines *h*. In fig. 5, the rail is of wrought-iron, and the sleeper may be formed either of wrought or cast-iron; and they are connected by bolts and nuts as at *g*, or *h*. When the sleeper is made of wrought-iron, the centre rib, which is to fit into the hollow in the under side of the rail, is, by preference, to be rolled hollow, as indicated by the dotted lines *i*; and it is the use of this central rib which is stated to constitute the novelty of this bearer. If cast-iron is the material employed for the sleeper, it is to be cast with a series of hollows or recesses along the under side of the central rib. When wrought-iron sleepers are used, the two lines of railway may be connected by tie-rods, secured to the sleepers by bolts and nuts, as at *j*, in figs. 4, and 7. Fig. 6, shews another form of rail and sleeper,—the rail being of wrought-iron, and the sleeper of cast-iron. Felt may be placed between the above rails and sleepers, if desired.

The patentee states, that he does not claim the making of continuous longitudinal bearers of cast or wrought-iron, as other constructions of continuous iron-bearers for rails of railways have before been used; but he claims the several constructions and combinations of longitudinal bearers and rails above described.—[*Inrolled October,* 1851.]

To Annet Gervoy, *of Lyons, in the Republic of France, Director of the Lyons Railway, for means to prolong the durability of the rails on railways.*—[Sealed 13th February, 1852.]

It is stated that wrought-iron rails of railways become crystallized and weakened by the repeated vibrations arising from the passage of trains along them, and their durability is consequently lessened. Now, this invention consists in taking up the rails, after they have been in use several years (generally from eight to ten years), and heating them, for the purpose of restoring or bringing them again to a fibrous state.

The time for taking up the rails will depend on the quality of the iron, and the amount of traffic.

The heating of the rails may be effected in any suitable furnace or oven. The patentee, however, prefers to employ a furnace constructed in the manner represented in Plate III. Fig. 1, is a plan view of the furnace; fig. 2, is a vertical section in the line 1, 2, of fig. 1; and fig. 3, is a vertical section in the line 3, 4, of fig. 1. The furnace is divided into two compartments *a*, *b*; and the former is provided with a fire-place *c*, from which the products of combustion pass along the compartment *a*, descend through the vertical flue *d*, into the horizontal flue *e*, ascend therefrom through the vertical flue *f*, into the compartment *b*, and thence escape into the chimney *g*. There are two slides at *h*, and *i*, by which the heated products can be shut off from the second compartment, and made to proceed through the flue *e*, into the chimney *j*. At the end of the furnace, where the rails are introduced, there is a roller *k*, mounted on standards *l*, for the purpose of supporting the rails while they are being pushed into the furnace.

The rails are to be first introduced into the compartment *a*, and supported at intervals, so as to keep them off the bottom or bed of the furnace,—the supports being sufficiently near to each other to prevent the rails from bending when heated. After the rails have been brought to a red heat, they are removed to the second compartment of the furnace, in which their heat is reduced. The furnace is so worked that, when the rails in the first compartment have been raised to the highest degree of heat, the slide *h*, is closed and the slide *i*, opened, in order to cause the heated products to proceed to the chimney *j*, instead of entering the second compartment; and, when the heat of the rails in the second compartment is so much reduced that they have lost all appearance of redness, they are taken out, and the rails in the first compartment are removed to the second compartment. A fresh supply of rails being now introduced into the first compartment, the slide *i*, is closed and the slide *h*, is opened; and the operation then proceeds as before.

The patentee claims, as his invention, the means, above described, of prolonging the durability of the rails used on railways.—[*Inrolled May*, 1852.]

To Perry G. Gardiner, *of the City of New York, in the United States of America, civil engineer and machinist, for improvements in the manufacture of malleable metals into pipes, hollow shafts, railway wheels, or other analogous forms, which are capable of being dressed, turned down, or polished in a lathe.*—[Sealed 8th December, 1851.]

This invention has reference to the employment of rotating dies or pressing surfaces for swaging, or otherwise forming by pressure, all articles in malleable metal which are capable of being wrought to the required shape by the action of such rotating dies or pressing surfaces. To illustrate one mode of applying this invention, the patentee takes the case of a railway carriage wheel, to be made out of one mass of malleable or wrought iron. If the mass of iron be heated, and placed between two dies, which are then forced together by great pressure, a wheel will be produced corresponding in form to the dies employed to shape it; but the wheel so produced will lack the requisite finish of smoothness and polish, and will, in almost all cases, have cracks and irregularities, calculated to destroy its value as a wheel. Whereas, if, in addition to the pressure in a direct line upon the mass, this pressure were accompanied by a rotary motion of the dies or swages in opposite directions, the mass of iron would be drawn or worked so that its fibres would lie in concentric rings, or in helical lines; and the result would be a wheel with a beautifully smooth, even, and regular surface, wrought and swaged into one solid mass, and ready to be fitted upon the axis after boring.

Again, to take the case of a very different manufacture, wherein malleable metal is subjected to pressure between dies, viz., the manufacture of lead pipe. If a mass of lead is acted upon while cold, and after the ordinary manner of making lead pipe, the force required is very great, and necessitates the employment of hydraulic engines. The pipe, thus produced, comes out with the grain or fibre of the metal always laid lengthwise of the pipe, and is very liable to split when subjected to a slight internal pressure, or while being bent to any required form; but if the mass of lead, whether cold or heated, be placed in a chamber or die, which, while it receives but a comparatively moderate pressure, is also acted upon on the side where the pipe is to be drawn out by a rotary die, the power required will be considerably less than in any other case, and the action of the rotary die or side of the

chamber will be to lay the fibre of the metal transversely to the axis of the pipe—in other words, round and round.

In order that the invention may be perfectly understood, the patentee considers it will be sufficient to explain the application thereof to the two manufactures above alluded to, as its more extended application will be obvious from these two examples.

In Plate IV., fig. 1, represents a longitudinal elevation of a machine constructed in such a manner that, by means of rotary dies or swages, capable of gradually approximating to each other, any required round shape or form of metals, whose sides have continuous lines or planes in the circular direction, may be produced (such, particularly, as a solid wrought-iron carriage wheel),—the metal, first properly heated, being drawn or swaged into a form the counterpart of the dies or swages, which, in the present instance, are formed to the shape of the outer surface of a railway carriage wheel, as shewn in the enlarged sectional view, fig. 2. Fig. 3, is a vertical section of the machine, taken in the line 1, 2, of fig. 1. *d*, is the bed-frame or plate. *b*, *b*, b^1, b^1, are standards, firmly fixed to the bed-plate, and serving to carry the shafts *v*, v^1. The standards b^1, b^1, are connected together by the rod *n*, which acts as a brace to keep the standards and bed-plate firm, and prevent springing. The shafts *v*, v^1, carry the dies or swages *e*, e^1; and, with the dies attached, have the same straight line for their axis or centre of revolution. The shaft *v*, which is hollow, has a nut *c*, bolted to its outer end; and, at the other end, is provided with a flanch and screw-thread to receive and hold the die or swage *e*, which is made removable, so that dies or swages of different forms may be substituted, as required. *a*, *a*, are pulleys or drums, attached to the shafts *v*, v^1, by which a rotary motion, by means of belts, is communicated to the shafts and dies in opposite directions. *k*, is a spindle, passing through the shaft *v*, with a thread on one end, corresponding to the female screw or thread in the nut *c*, while the other end is formed with a flanch or upset *h*, and terminates in a core or mandril *i*, corresponding in diameter with the size of the hole required in the centre of the finished shape of metal. This flanch *h*, limits the movement of the spindle in one direction; and when screwed up tight to the bottom of the inside hole of the shaft *v*, the outer face of this flanch forms a part of the die or swage itself. On the spindle *k*, at the other end of its axis, a fly-wheel z^2, is fixed, and, by turning it, the spindle *k*, is caused to move endwise (by reason of its screwed

end working in the nut *c*), and force the carriage wheel out of the die *e*, at the completion of the operation.

On one of the standards b^1, are cast the side pieces *f*, *f*, which rest on, and are attached to, the bed-plate, and have slots or openings cut through them horizontally, on both sides, parallel to each other. Upon the shaft v^1, is fixed a box *g*, which extends between the side pieces *f*, *f*, and rests upon them. This box *g*, has two lateral projections or keys *o*, which fit into the parallel slots, and are capable of sliding backwards or forwards therein: by which means the shaft to which the box is attached, when moved longitudinally, for the purpose to be presently explained, will have no lateral or upward or downward motion, but will be constrained to move in a straight line. This forward or backward movement of the shaft v^1, is produced by two revolving screws *y*, passing through holes in the box *g*, formed with suitable threads or female screws therein to receive the screws *y*,—so that while the shaft is revolving, it will communicate (through the die or swage which it carries) the requisite pressure to the metal under operation between the dies. To the ends of these screws are affixed the spur-wheels z^1, z^1, gearing into each other, and driven by a spur-pinion on the spindle *r*, which is turned by means of the fly-wheel *z*. The shaft v^1, is provided with a flanch and screw on one end, to receive and firmly hold the die e^1. The die or mould at the end of the shaft *v*, is shaped so as to give to the metal, placed between the two dies, the form required on that side; and the die or mould on the end of the shaft v^1, is shaped to the form required for the other side of the metal; so that when the two dies are brought together, and the pressure and rotary motion given, the form required will be communicated to the metal by the combined operations of pressure and turning, drawing, or swaging.

In order to make a railway carriage wheel, the shaft v^1, is drawn apart from the shaft *v*, by the operation of the fly-wheel *z*, and the wheels and screws attached; and the mass of iron, of the required weight, heated to a soft welding heat, is placed within the die upon the shaft *v*. The fly-wheel *z*, is then turned so as to bring the die upon the shaft v^1, in contact with the heated metal; and the pulleys or drums *a*, *a*, are set in motion, in opposite directions, by means of power-belts. While the shafts and dies are revolving, and the metal is being operated upon, pressure is kept up and graduated by turning the fly-wheel *z*, by hand or other power. The more rapid the revolution of the shafts and dies, the less

time will be required to finish the operation; and the faster the rotary motion, the less will be the amount of pressure required to be put on, by means of the screws, to complete the operation in a given time. When the dies come into contact with each other, the wheel will be formed solid, with a smooth and beautiful surface, and welded or swaged with the fibres of the iron drawn and laid evenly on either side of the wheel. If thought necessary or convenient, the shaft and dies may be placed vertically, with corresponding changes in the other parts of the machinery. The hole in the centre of the wheel should be of a size a little smaller than is required, so as to allow of its being bored to fit exactly the axle for which it is intended. When a very slow rotary motion is given to the dies or swages, the mass of metal to be acted upon may require a second heat; but the velocity, pressure, and heat, must be regulated, to some considerable degree, by the nature of the metal acted upon, and the form required. By this improved process, lead may be drawn or swaged into beautiful forms when rounded figures are required,—the lead being operated upon in a cold state; and so with tin or other metals or alloys soft and ductile enough to be drawn in this manner.

A modification of the above, and of the machinery for carrying the same into effect, may be applied to the manufacture of lead pipe, and of pipe from metals or alloys that are of a ductile nature, and to the manufacture of hollow shafting, from wrought or malleable iron, for steam engines, or other purposes. The machinery for the last-mentioned purposes acts upon the same principle of combined pressure and simultaneous rotary drawing or swaging of the metallic mass under operation.

Fig. 4, exhibits a longitudinal section of a machine for drawing metal pipes or hollow shafting; and fig. 5, is a transverse section of the same. w^1, is a shaft, resting in bearings in the standards b, and carrying at one end a die, mould, or swage e^2. At the other end, this shaft is hollowed to receive the screw x, which operates in a nut y, bolted to the flanched end of the shaft w^1, for the purpose of moving the shaft w^1, backwards and forwards in a straight line with the other and opposite shaft w. s, is a spindle, supported in bearings in the standards b, c, and carrying a pinion $z*$, which gears into and drives the spur-wheel z; on the screw x,—motion being given to such spindle by the fly-wheel z^1. The shaft w^1, is provided with two feathers or projections at opposite sides, which fit into corresponding key-slits or openings in the pillar-blocks b, b, and serve to hold the shaft w^1, steady, so as to permit

no lateral or rotary movement, but yet allow of it being slidden backwards and forwards by the action of the screw x. The shaft w^1, is furnished with a screw to receive the die or swaging mould e^2, which fits against a flanch on the shaft. In this die e^2, is keyed a spindle or rod t, which is sufficiently long to project through the centre of the die carried by the shaft w, when the two dies are in contact, and is moveable horizontally. The projecting end of the spindle acts as a core to determine the inner diameter of the pipe to be made; and its diameter will therefore depend upon the kind of pipe required. The shaft w, is made hollow, with its internal diameter or bore of a size sufficient to admit of the pipe, as it is formed, passing freely through it, and thence out of the machine; and it is furnished with a flanch, against which the die e^1, abuts, and a screw-thread for holding the die firmly in its place. This die is fitted with a steel ring q, the inner diameter of which corresponds to the outside diameter of the pipe or shafting to be made. The front of this die or mould e^1, forms a hollow cone (with its apex towards q), which may have a smooth internal surface, or have grooves cut into it, either spiral or straight, from the centre outwards. The die e^2, is hollow, having its internal diameter equal to the external diameter of the die e^1, so that it will fit upon and be capable of sliding over that die; and the bottom or inner end of e^2, is provided with grooves running from the centre outwards.

The metal should be cut, shaped, or moulded, to fit the chamber formed by bringing the two dies together;—a central hole is to be made through the mass, to admit of the spindle or core t, passing through it. When lead, or a similar soft and ductile metal or alloy, is to be used, it may be put in either in a cold or heated state; but if iron is to be operated upon for making hollow shafting or pipe, it must be highly heated, so as to be in a soft welding state. When the metallic mass, thus prepared, is placed within the dies, the shaft w^1, with its die or swage e^2, is screwed up, and brought forward towards e^1, by turning the fly-wheel z^1; at the same time, the shaft w, with its die e^1, attached, is rotated by a strap from any first mover passing over the drum a; and this rotary movement, together with the forward pressure of the die e^2, will cause the metal to exude from the chamber formed by the dies, in the shape of pipe or shafting, and pass out of the machine through the hollow shaft w. It may then be coiled upon a wheel, supported by a suitable frame, at the end of the machine. Lead pipe may in this way be made of any length, by a renewal of the mass of metal as it is, from time

to time, reduced in the dies or swages—the pieces or parts being perfectly united and welded by the operation, so as to form continuous pipe, as long as desired.

Lead pipe, lined with tin, may also be easily made by this machinery—the tin for the inside coating being placed inside of the leaden mass, in the form of an inner ring of tin.

The patentee claims the manufacturing of malleable metals into pipes, hollow shafts, railway wheels, or other analogous forms, which are capable of being dressed, turned down, or polished in a lathe, by the employment in such manufacture of a pair of suitably-shaped dies or swages; one or both of such dies or swages being made to revolve, and being gradually brought into closer proximity; whereby the mass of metal which is placed between them, to be acted upon, is caused to assume the form of the article required to be made. He also claims the general arrangement and construction of machinery, as above described, for carrying out the principle upon which the invention is based.—[*Inrolled June,* 1852.]

To George Sheppard, *of Stuckton Iron Works, Fording Bridge, in the county of Hants, engineer, for improvements in the construction of apparatus for grinding grain and other substances.*—[Sealed 13th November, 1851.]

This invention refers, firstly, to the separation of the air (which, during the operation of grinding, is drawn between the millstones) from the meal, or other pulverized material, as it is delivered from the grinding surfaces;—the object being, to prevent the waste and other inconveniences which have hitherto been occasioned by passing the flour and air out from the case surrounding the millstones at the same vent into a receiving chamber, whence the air was allowed to escape. To attain this end, the patentee encloses the stones in an air-tight case, having two outlet-pipes or passages,—one at top, for the escape of the air, and the other at bottom, for the escape of the meal or other pulverized material; and, when operating with two or more pairs of stones, he connects the air-outlet-pipe of each case with a main air-trunk, which leads to the case of an exhaust-fan; whereby he is enabled to draw off the air simultaneously from the cases of all the stones that are in operation. The grain, or other material to be ground, is fed through the eye of the top stone or runner; and the periphery of this stone is provided with sweeps of a peculiar

form, which sweep the meal, as it exudes from between the grinding surfaces, down the shute into a receiver, and, at the same time, retard or prevent the meal from flying upwards and escaping from the case with the exhaust air.

In Plate III., fig. 1, represents a vertical section of a pair of stones, fitted up according to this invention. A, is the bed-stone; and B, is the runner, connected by means of a central cross-bearing C, to a driving-spindle D. Within the eye of the runner is a flanged ring *a*, which carries a tube *b*, forming the inner periphery of the annular casing E. This casing encloses the runner, and is rendered air-tight, or nearly so, by fitting tightly round the bed-stone. F, is a pipe, leading from the case E, to the main air-trunk G, which is in connection with the fan or blower H, and is intended to form a channel of communication between this exhausting apparatus and the several pairs of stones contained in the mill. I, I, are the sweeps, affixed to the periphery of the runner, and intended to push forward the meal as it passes out from between the grinding surfaces, and deliver it into the descending spout or shute K, which guides it into a suitable receiver. The form of these sweeps is best shewn in the detached view fig. 2, which represents one of the sweeps in edge view. It is bent over, as shewn, for the purpose of intercepting (as the stone is rotating in the direction of the arrow) any particles of meal that may be following the course of the air, and thereby preventing their escape through the pipe F. The several pipes, which establish a connection between their respective cases E, and the main air-trunk G, should be provided with valves, in order to cut off that connection when any of the pairs of stones are not in work; and each shute K, should be provided with a valve, to prevent the possibility of the return of the meal into the case E, by the too violent action of the exhaust-fan.

The operation of the apparatus is as follows:—The fan H, having been set in motion, and grain, or other substance to be operated upon, being fed into the mill, a current of air passes down the eye of the runner with the grain,—traverses between the grinding surfaces (keeping them cool, and assisting the grinding action), and eventually passes up the pipe F, into the air-trunk G, from which it makes its escape into a chamber, and thence into the atmosphere, or into the atmosphere direct. The grain in the meanwhile having been reduced to meal, is delivered on to the bottom of the case E, and is gathered up by the sweeps I, and discharged from the case E, down the shute K. In order to ensure the perfect

separation of the meal from the air, a silk, canvas, or wire cloth diaphragm is fitted within the case E, as shewn at L; whereby any particles that may pass the sweeps I, will be effectually prevented from escaping with the air up the pipe F.

The second part of this invention refers to the construction of the mill-stones,—the object being, to produce stronger and more durable stones, possessing a better grinding surface than those at present in use.

Fig. 3, is a plan view of a mill-stone constructed on the improved plan. It is composed of taper buhrs *a, a, a,* of such shape that, when set radially, they will produce the form of stone required. They are bound together by iron bands, which, being passed round their periphery, hold them firmly in their place.

The patentee claims, First,—the means above described, whereby he is enabled to separate the air which is drawn in between the grinding surfaces (for ventilating the stones or keeping them cool) from the meal or other manufactured product, and to deliver such product into a suitable receiver, without the waste or inconvenience heretofore resulting from the use of a current of air for ventilating the grinding surfaces. Secondly,—he claims the constructing of mill-stones as above described.—[*Inrolled May,* 1852.]

To CHARLES HOWLAND, *of New York, engineer, for improvements in apparatus for ascertaining and indicating the supply of water in steam-boilers.*—[Sealed 19th December, 1851.]

THE improvements in apparatus for ascertaining and indicating the supply of water in steam-boilers, which constitute this invention, consist in combining with a metal cylinder, of suitable length and diameter, a glass indicator-tube, fixed to the top of the cylinder, and a float, working in the cylinder, and having a stem attached to its upper side, so as to project upwards in the glass tube and indicate the water line in the boiler, when the cylinder is connected to the head or other suitable part of the boiler,—also in combining with the same, by means of a recess in the side of the cylinder, an escape-pipe, leading to an alarm or steam-whistle, and a stop-valve and lever arrangement, to be operated upon by the descent of the float in the cylinder, whenever the water in the boiler gets below a certain point.

In Plate IV., fig. 1, is a vertical section of the apparatus, and fig. 2, is a plan view thereof. *a*, is the cylinder, which is made of brass or other suitable metal, and is connected to the head or other convenient part of the boiler by means of the pipes a^1, a^2, so that the water will stand at the same height in the cylinder as it does in the boiler. The cap-plate *b*, supports a glass tube *c*, closed at the top and open at the bottom, for the purpose of communicating, through an opening in the plate *b*, with the interior of the cylinder *a*; and the tube is held in its place by a screw-cap *d*, fitting in a screw-socket on the cap-plate. *e*, is a float, having a stem *f*, which projects upwards within the glass tube, and, as the float rises and falls with the varying heights of water in the boiler, it indicates in the glass tube the height of the water-line. *g*, is a chamber or recess in the side of the cylinder *a*, for the reception of the steam escape-pipe *h*, which has a valve-seat at the top for the valve *i*; and, at the lower end, the pipe is screwed into the bed-plate *j*, of the cylinder, which has a channel or passage formed in it for the purpose of establishing a communication between the pipe *h*, and the hollow stem *k*, of a steam-whistle *l*. The valve is attached to a rod *m*, which passes through the eyes or guides *n*, *n*, on the side of the escape-pipe, and rests on the toe of the lever *o*. The long end of this lever extends across the interior of the cylinder *a*; so that when the float descends, on the water becoming low in the boiler, it will rest upon and depress that end of the lever,—thereby raising the rod *m*, and valve *i*, and permitting the steam (which enters the cylinder *a*, through the pipe a^1,) to pass through the pipe *h*, to the whistle. By this means, whenever the water becomes too low, the attention of the attendant will be drawn to it by the sound of the whistle.

The patentee states that what he claims is the use of a cylinder, having an indicator-tube, in combination with a float, having an indicator-stem attached thereto, for working in the glass indicator-tube for indicating the water-line in steam-boilers, in principle substantially as set forth. He also claims the use of the escape-pipe, valve, and lever arrangement, as a combination, and their combination with the cylinder, and float, and alarm or steam-whistle, in principle substantially as set forth.—[*Inrolled June*, 1852.]

To SYDNEY SMITH, *of Nottingham, for improvements in indicating the height of water in steam-boilers.*—[Sealed 22nd December, 1851.]

THIS invention relates to the apparatus employed for indicating the height of water in steam-boilers; and it consists in causing a pointer or indicator to be moved by means of a magnet, which is put in motion by the rise and fall of the water in the boiler.

In Plate IV., fig. 1, is a front view and fig. 2, a longitudinal section of one form of indicating apparatus. *a*, is an ordinary magnet, affixed to a brass axis *b*; and it is enclosed in a steam-tight case *c*, which is attached, by means of the tube *d*, to the boiler. On the end of the axis *b*, is fixed a pulley *e*, to which motion is given by the rising and falling of a float in the boiler, through the medium of a chain. *f*, is a steel pointer, moving freely on an axis in front of the graduated scale *g*. The magnet works freely in the case *c*, and acts upon the steel pointer *f*, through the brass diaphragm *h*. As the water rises and falls in the boiler, the float gives motion to the pulley *e*, and, consequently, to the axis and magnet; and as the pointer *f*, follows the motions of the magnet, it indicates upon the graduated scale *g*, the height of the water in the boiler.

The form of the apparatus may be varied, and, in place of having a rotating pointer or indicator, the pointer may be caused to rise and fall or move over a graduated scale, fixed on a steam-tight case, such as shewn at figs. 3, and 4;—fig. 3, being a front view and fig. 4, a vertical section of the apparatus. *h*, is the magnet, the poles of which are bent at right angles, as shewn at fig. 4; it is affixed to the top of the vertical brass stem or rod *i*; and this rod, at the lower end, is connected with the float in a steam-boiler, in such manner as to rise and fall with the changes of the water-level in the boiler. *j*, is the indicator, consisting simply of a short rod or wire, which is attracted by the poles of the magnet through the brass plate or diaphragm *k*, forming part of the case of the instrument; and, consequently, as the magnet is caused to rise or fall by the action of the float, the indicator will rise and fall also, and indicate upon the graduated scales *l*, *l*, the height of the water in the steam-boiler.

The patentee claims, as his invention, the application of a magnet, single or compound, combined with suitable appara-

tus to give motion to a pointer or indicator, in such manner as to indicate the height of the water in a steam-boiler.—[*Inrolled June*, 1852.]

To WILLIAM EDWARD NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in manufacturing yarns,—being a communication.*—[Sealed 10th October, 1850.]

THE object of this invention is to spin threads, by a continuous operation, from rovings of wool, or of which wool is a material part; and it is likewise applicable to the spinning of other long fibres. It consists in condensing the rovings (as they are being stretched continuously between two or more sets of drawing-rollers) by means of an endless band,—the parts of the inner surface of which, moving in opposite directions in contact with such rovings, impart a counter-twist, to condense and ensure regularity in the stretching operation; and the invention also consists in combining flyers for spinning with the method, above stated, of condensing during the stretching operation.

A partial front elevation of a machine, arranged according to this invention, is represented in Plate III. *a, a,* are the spindles; and *b,* is the framework. The spindles carry bobbins *c,* and are surrounded by what are known as ring-groove flyers *d;* and the spindles are driven by bands *e,* from a drum or cylinder *f,* on the main shaft *g,* which receives motion from some first mover, in the usual way. Motion is communicated from the main shaft, by a train of pinions and cog-wheels, to the two main drawing-rollers *h,* and *i,* on one side, and by another train to the corresponding drawing-rollers on the other side. These sets of drawing-rollers are provided, in the usual manner, with weighted cap-rollers *j;* and the main rollers of each set are placed at such distance apart as may be suited to the drawing of long fibres.

The spool *k,* (on which are wound the rovings *l,*) rests on a cylinder or drum *m,* which receives motion from the roller of a wheel of the second train by a third train of pinions and wheels. The journals *n,* of the spool lie in slots made in the standards *o, o,* of the frame; so that, as the diameter of the spool decreases by the unwinding of the rovings, the axis may continue to descend, and thus permit the giving-out motion to be derived from the constant circumference of the cylinder or drum, and therefore to be regular.

The rovings pass from the spool between the first set of

drawing-rollers, and from the lower set of drawing-rollers to the flyers, to be spun, twisted, and wound on the bobbins, which are to have the usual traversing motion communicated to them, in order to wind the threads properly and regularly thereon. Just above the lower set of drawing-rollers there is an endless band *p*, made of cloth or list. This band passes around a grooved wheel *q*, upon a shaft *r*, actuated by two mitre-wheels *s*, *s*; one of which is mounted on the end of the drawing-roller *h*, of the upper set; and from the wheel *q*, the band passes between two guide-pulleys *t*, *t*, over and in contact with a bed *u*, to and around a loose grooved wheel *v*, thence returning under a guide-pulley *w*, to and under the guide-pulleys *t*, *t*, and around the first grooved wheel *q*. The wheels and pulleys are grooved to receive the entire breadth of the band, and to guide it; and the position of these guide-pulleys is such that the part of the band, running in one direction, shall press on the part running in the opposite direction. At given distances apart there are springs *x*, which bear, with a gentle pressure, on the upper part of the belt, in order to press it down upon the under part. The rovings, as they are being stretched or drawn out between the two sets of drawing-rollers, pass between the two parts of this band *p*, which, by the opposite motion of its two parts, gives a counter-twist, to prevent the rovings from separating, and has the effect of condensing the fibres, so as to ensure regular and even threads.

The band *p*, being near to the lower set of rollers, the condensed rovings pass directly to and between the lower set of rollers, and are spun into threads between the lower set of rollers and the flyers. If it be desired to spin threads with the fibres twisted in the thread, the flyers should turn in the direction to give the twist to the threads in the same direction as the band; but if, on the contrary, it be desired to produce threads with fibres standing out, then the twist should be given in spinning the reverse of the motion of the band.

In the above description, the spinning is stated to be performed by what is known as the ring-groove spinner; but any other flyer, adapted to the spinning of such fibres, will answer the purpose. In making the endless band of cloth, care should be taken, in connecting the two ends, to make a smooth or even joint. Cloth-list is the substance which has been used for this purpose with success; but felt and even buff-leather and other substances may be employed. It has been stated, that the band for giving the counter-twist is placed in close proximity to the lower set of rollers, because,

in that position, the best results have been obtained; but, if it is placed higher up, satisfactory results may be also obtained, although the inventor prefers to arrange the several parts as shewn.

The patentee does not limit himself to the construction and arrangement of the details, as these may be variously modified. What he claims is, condensing rovings of wool or other long fibres (during the operation of drawing continuously between rollers) by means of an endless band, the inner surfaces of which, acting on the rovings as they are being stretched or drawn between the sets of drawing rollers, impart a counter-twist, to condense and produce regularity in the stretching or drawing operation, as described.

Secondly,—he claims, in combination with the above-described method of condensing and twisting rovings, the adaptation of flyers for spinning the rovings immediately into threads as they pass from the last set of drawing-rollers, as described.—[*Inrolled April,* 1851.]

To William Brindley, *of Queenhithe, for improvements in the manufacture of flocked fabrics and in the manufacture of buttons.*—[Sealed 27th January, 1852.]

This invention relates, firstly, to the manufacture of flocked fabrics from paper and other fabric which has been previously rendered waterproof; and, secondly, to the covering of what are called die and pressure-made covered buttons with waterproof paper, prepared so as to resemble japanned or patent leather.

In carrying out the first part of this invention, if the fabric to be flocked is paper, the patentee prepares the same so as to make it waterproof, as described in the specification of his patent of February 28, 1849; then he applies to the surface of such paper any of the well known adhesive materials employed by paper-hanging manufacturers for causing flock to adhere to paper; and he applies the flock to the surface of the paper, so prepared, in the manner usually adopted for producing ordinary flocked paper. When linen and other fabrics are to be flocked, they are first rendered waterproof by the process described in the aforesaid specification for waterproofing paper; and then the adhesive materials and flock are applied thereto. It is not necessary, when applying flock to paper and other fabrics, prepared by this waterproofing process, to use size or other preparer previous to the applica-

tion of the adhesive material, as is now practised in the ordinary operation of flocking paper.

Paper prepared in the above manner may be used with advantage for covering walls, especially external walls, and in damp situations—also for covering die and pressure-made covered buttons, such as described under the second head of this invention; and paper or other fabrics, so prepared, may be employed, amongst other uses, for covering books. In some cases, the patentee applies the flock to both sides of a fabric. When so applied to "thick paper fabric," the same will be found useful for cutting into gun-wads; and woven fabrics, flocked on both sides, may be made into waistcoats and other articles of dress.

In carrying out the second part of this invention, the patentee takes paper, prepared as described in the above-mentioned specification, and applies thereto a coating or coatings of japan in like manner to that adopted in japanning leather. He has not thought it necessary to describe the process; as this part of the invention does not consist in the process, but in applying such process of japanning to paper, prepared as described in the former specification, and employing such japanned paper for covering what are known in the trade as die and pressure-made covered buttons. The buttons are covered with the japanned paper by like means to those adopted for covering buttons with silk and other woven fabrics.

The patentee claims, First,—the application of flock to paper and other fabrics, prepared as above referred to. Secondly,—the manufacture of buttons of paper, prepared as above explained.—[*Inrolled, July,* 1852.]

To ROBERT MILLIGAN, *of Harden Mills, near Bingley, in the county of York, manufacturer, for a new mode of ornamenting certain cloth fabrics.*—[Sealed 26th April, 1851.]*

THIS invention consists in printing in one or more shades or tints, any device or design upon or over flock-printed coloured

* In a Disclaimer and Memorandum of Alteration, dated May 19, 1852, the patentee states that he has been informed that such part of his invention as relates to the printing of fabrics which are not made wholly or partly of alpaca wool, is not new; and he therefore disclaims those parts of his specification that describe the printing of fabrics in the manufacture of which alpaca has not been used. He gives a copy of the specification at length; and strikes out, with red ink, the words which, in the above description, are printed in *italics*.

cloths or fabrics, composed, or partly composed, of alpaca wool, [*or composed of worsted or wool and cotton mixed (such as what are called coburgs), or composed of other suitable mixtures of the before-named materials*] with what is usually known by the name of zinc paint or with oil colors or pigments.

It is essential for the [*effective*] carrying out of this invention, that the cloths or fabrics should be composed of alpaca or [*other wool or worsted and mixtures of these materials, or at any rate*] partly composed of [*these materials*] this material; and the pigments which have been found best for the purposes of this invention are those now known by the name of zinc paints—being oil colors, the principal body of which is oxide of zinc, or white zinc, instead of oxide of lead, or white lead. The patentee obtains the required shade or tint by mixing small quantities of pure color with the zinc body; and then he prints in the ordinary manner, according to the design or effect intended to be produced upon or over the cloth or fabric; and it is stated that the flock on the flock-printed portions of the cloth or fabric will be found to be ornamented as highly as any other part, or even more so, according to the contrast of color selected. He further observes, that very good effects may be produced by merely printing on dark grounds with white or light colors on fabrics, whether flock-printed or not, or on grounds of a color merely differing in intensity of shade,—the use of zinc color being equally important in all cases.

The patentee claims, as his invention, First,—generally, the use of zinc paints, such as he has described, for printing upon fabrics composed of such materials as are above described. Secondly,—printing with the aforesaid zinc paints, or with ordinary oil paints, or with opaque pigments, mixed with any suitable oil, varnish, or gum, insoluble in water, on, upon, or over flock-printed colored cloths or colored fabrics composed of such materials as are above described. Thirdly,—printing on those parts of such cloths and fabrics which are not covered by the flock, with such paints or colors as aforesaid. —[*Inrolled October*, 1851.]

Scientific Notices.

SANITARY REFORM.

The zeal which has been of late so manifest among local and other boards, the newspaper press, &c., in hunting down and dragging before the bar of public opinion, both conscious and unconscious offenders against their neighbours' olfactories, unmistakably indicates the direction of the popular feeling upon this most important subject, and points out an easy road in which popularity hunters may attain their desired end. In a country constituted like England, where all reforms are carried by the voice of the people, who, in respect of abstruse political, or scientific questions, are, for the most part, incapable of discerning between truth and error, it is, however, necessary to guard against the possibility of a generous public feeling being perverted to benefit private interests. This is especially requisite in the matter of sanitary reform; for the nuisances which are most complained of, and which are, in general, the subject of the most eloquent denunciations, are not those of a public character, such as the pollution of the Thames, by discharging into it the contents of the London sewers; but they are based upon the fact of the emission of some unpleasant odour, which may be said to be inseparable from certain important branches of industry. Now it cannot be denied that all interference with private interest, under what pretext soever, should be jealously watched, and that public functionaries should take the greatest care, consistent with the public health, that what is popularly deemed a nuisance should be demonstrated to be such before the law is brought to bear upon what is considered to be the vested rights of individuals. We do not, however, find that it is the practice for scientific inquiries to precede summary convictions; on the contrary, it seems to be sufficient to produce evidence, that the pure air of a particular locality has been contaminated with an odour somewhat less delightful than fresh-gathered roses, and a conviction of the culprit is inevitable. His works may be stopped, his property virtually confiscated; but what is that to my Lord Mayor, who alone, as conservator of the Thames, possesses the vested right to keep in perpetual whirl, under the noses of Her Majesty's subjects, the foulest mixture that ever was concocted by the industry of man! We have been drawn to these reflections by the remarks of a correspondent on a recent case, which was brought before the

Court of Aldermen, and which is, not without reason, supposed to have found its way there by the assistance of parties, whose hostility to the Company proceeded against, is open and avowed. Without agreeing, in every point, with the opinions expressed by our correspondent, we think his remarks deserving of attention, coming as they do from one practically acquainted with the subject on which he writes. The nuisance complained of is one that appears to have been knowingly permitted for about 40 years; and the City Solicitor now, for the first time, applies for an order to stop the City Gas Company from running into the Thames the residuary products of the purification of gas. Our correspondent, writing on behalf of the industrial interests of the country, says:—

"Now, admitting that the City Gas Company really does empty the waste residue of the purification of gas into the Thames, the question which next arises is, of what nature is this waste residue? for it is whispered, that something of the same kind is allowed to infiltrate into the ground in another place; and it may become an interesting subject of inquiry to know whether, of the two, the Thames is not, after all, the most sanitary locality. The fluid discharged by the City Gas Works is almost exactly similar in its leading characters to the active ingredients contained in the mineral springs of Moffat, Harrowgate, Aix la Chapelle, Baden, and other watering places, to which thousands of invalids yearly resort for the renovation of their health. This may appear to be a startling fact, but it is a fact nevertheless; and these waters owe their curative powers to the presence of sulphuretted hydrogen, which is the very gas contained in the fluid poured into the Thames by the City Gas Company. Are we then to conclude, that the sulphuretted hydrogen gas possesses different properties in different places; and that, whilst at Harrowgate it conduces to health, in London it is the *primum mobile* of disease? On this latter supposition its effects should, long ago, have shewn themselves in an increased mortality and rate of sickness amongst the men employed in gas works; whereas it is quite notorious that the very contrary is the case; as these men are singularly free from inflammatory and febrile affections, and are absolutely exempt from most kinds of epidemic disease. Yet, in spite of truths like these, our manufacturers are subjected to the most cruel and ruinous prosecutions, from a barbarous belief, that an unpleasant odour must necessarily be injurious to health. We talk, indeed, with an affection of pity concerning the Spanish Inquisition, but is the persecuting spirit of this sanitary movement not equally bigotted, blind, and unjust?—is it not, in fact, as opposed to

the interests of our national industry as ever was the inquisition to the interests of true religion? As a proof of the vast ignorance prevailing upon the subject of sanitary reform, we may mention that, during the periods of our most fatal epidemics, no peculiar odour has ever been remarked; and in the fens of Lincolnshire, in the Pontine marshes, near Rome, in the Maramma in Tuscany, and in the department of the Landes in France, where a single night's exposure will insure an attack of fever, no smell whatever, either disagreeable or otherwise, can be detected. Indeed there never was a more gross and palpable sophism than the appeal to the nose, with which our self-styled sanitary reformers lay the foundation of all their operations. Nor is it a little singular that chlorine, which they are pleased to regard as a powerful sanitary agent, possesses an odour almost as offensive as that of sulphuretted hydrogen, and, most unquestionably, brings on an inflammatory affection of the respiratory organs when inhaled into the lungs.

It is high time that the manufacturing interest of this great country began to take care of itself, in respect to the interference of these sanitary reformers. Armed with the prejudices of the ignorant, the assistance of the interested, and the blind fears of the million, they are truly formidable, and, unless combatted by scientific facts and philosophical conclusions, they will shortly close both our manufactories and the reign of British industrial supremacy. Let our manufacturers therefore be on the alert, and join their forces together for a common defence. The case of the City Gas Company is really, by anticipation, the case of every manufacturer in the kingdom. If an occasional unpleasant smell be the only criterion by which the fact of a nuisance is henceforth to be decided and adjudicated upon, then indeed have we a definite regulation, but one of so overwhelming and unlimited a character, that, from the peer to the peasant, it will be impossible for any mortal to escape its penal inflictions. What we want to know from these sanitory reformers is, in the first place, whether absence of smell implies exemption from disease; and, secondly, whether any distinct connection has ever yet been traced between the prevalence of any particular disease and the existence of any particular odour. We should then be in a condition to discuss the merits of the present sanitary 'razzia' upon the manufacturing interest of this country. Till then, however, we are justified in denying that either sulphuretted hydrogen, or any other gas, is a specific agent of disease, and we do accordingly deny it."

THE NEW PATENT LAW.

We last month offered a few remarks on Patent Law Reform, in anticipation of the passing of the Act, which was then under the consideration of the legislature; and, though fully aware of the desire of the Government to obtain a settlement of this much agitated question, we could speak with no confidence as to the ultimate fate of the Bill, which, during its progress through the two Houses, exhibited quite a chameleon-like capacity for changing its aspect, and promised even to belie its very title, by effecting anything but an *amendment* of the law for granting letters patent. Indeed, up to the last day of the Session, the fate of the Bill bid fair to be the same as that of its predecessor; and it was only from the Upper House conceding some important alterations, without which the interests of inventors would have materially suffered, that the long delayed reform in this most important branch of jurisprudence has taken place. The Act is, in substance, the same as the Bill reported in our last number; but some minor alterations, principally verbal, have been introduced. As it now stands, great doubt is entertained, in some quarters, respecting the efficiency of its working; but no certain conclusion can be arrived at on this point until we are in possession of the rules and regulations which the Lord Chancellor, the Master of the Rolls, and the law officers of the Crown (as the Commissioners appointed under the Act) are empowered to prepare, for carrying the law into operation. Although, therefore, it would be premature to pronounce a strong opinion, either in favor or against the Act, we think that, in one point of view, its passing is a matter for congratulation; for it has furnished at least this warranty, that the monstrous proposition, which had obtained some adherents in influential quarters, viz., that the practice of granting patents was contrary to the liberal policy of the age, finds no response from the great body of our legislators. To the promulgators of this new doctrine we must apologize, for having so long allowed their statements to pass unnoticed. Had we not believed them to be so utterly fallacious as to require no refutation, we should not have been silent on the topic, as nothing could be more easy than to prove their statements untenable; but now that it appears that men, whose opinions carry great weight, have signified their adherence to the doctrine of an equal division of the fruits of the inventor's labor, we cannot but hail the appearance of a new law, the avowed object of which is to confirm to inventors the rights they have so long enjoyed. In all

good nature, and without attempting to detract from their deserved reputation, we would offer to those who have openly advocated the abolition of patent rights, this piece of advice from Coleridge's Essays, as it is calculated to preserve them from again falling into the like error. This great philosopher says,—"It behoves us all to consider, that to write or talk concerning any subject, without having previously taken the pains to understand it, is a breach of duty which we owe to ourselves, though it may be no offence against the law of the land." Had this been put in practice in the case referred to, we should not have heard of *fame* being set forward as the proper aim of the ingenious mechanician. But, besides settling a question which, had it longer remained open, might seriously have compromised the prosperity of the industrial portion of the community, this Act will afford an opportunity of testing the value of an opinion which, carrying a certain amount of plausibility with it, has frequently been pressed forward as an argument against reducing the cost of patents. It is to this effect—that the possession of a patent by a poor man must infallibly be his ruin. The advocates of this opinion, unlike the promoters of the doctrine which we have just noticed, besides appealing to their own experience, might bring evidence to support their position from so early a date as the reign of Henry VI.; for that historical worthy Jack Cade is reported to have said,—"Is not this a lamentable thing, that of the skin of an innocent lamb should be made parchment? that parchment, being scribbled o'er, should undo a man? Some say, the bee stings: but I say, 'tis the bees' wax; for I did but seal once to a thing, and I was never mine own man since." Now this parchment may have been the specification of a patent; and who can deny that it was not? and, from its date, we may safely trace the commencement of his misfortunes. We cannot, at the moment, call to mind any other example—if this be one—of a poor man being ruined by the possession of a patent; but, even if the fact be as it has been stated, we are not sure that it would be prudent to legislate on such a matter; for we cannot but concur with Lord Cranworth, in his letter to the Amalgamated Society of Engineers, that, although the law mercifully interferes on behalf of women and children, it very properly makes no distinction between other classes of the community. For our own part, we are in noway desirous to see men cared for as babes; nor can we, although possessing a lively sympathy for the poor, consent to relieve poor inventors from the danger which is said to attend the bringing of patent protection

within their means. There are many trials attendant on poverty, which are in general borne with patience and fortitude; and this we feel assured will be among the number.

It has long been considered a great desideratum, by working men, that they should get an immediate temporary protection for their inventions, at little or no cost, whereby they would be enabled to demonstrate the value of their improvements, and thus secure the assistance of a capitalist, without the risk of being defrauded of, or otherwise losing, the legal right to their inventions. This privilege is now conceded; for, immediately upon the deposit of a declaration and petition, setting forth the title of the applicant's invention, and that he is desirous of having the same protected by letters patent, accompanied by a provisional specification, describing the nature of the invention, as provided by Clause VI., provisional protection, for six months, may be said to be secured. Some doubt exists respecting the cost of this security; as, in addition to a fee of £5 set down in the Act, it is provided, in Clause VIII., that the law officer to whom the provisional specification shall be referred, may call to his aid some scientific person, for the purpose of ascertaining whether the nature of the invention is properly set out, and that he may order the cost of such examination to be paid by the applicant. We trust, however, that this very necessary fee, instead of being variable, will be commuted, by the rules before alluded to, into an uniform sum, payable in all cases. The rules having reference to this stage of the proceedings will be well nigh as important as the Act itself; for, as no check, further than the discretion of the law officers to whom the applications are referred, is provided, for the rejection of applications which it would be inexpedient to certify to, there is the more need of introducing into the working of the new system such regulations as will at once supply the deficiency in the Act, and render the practice uniform and reliable.

Much has been said against the proposal to reject applications on the ground of want of novelty, or utility; and, upon the whole, we are inclined to side with the objectors to such an inquisitorial tribunal as the adoption of that practice would seem to require; but these are questions of great importance, which might, not only with advantage, but even without any attendant disadvantage, be determined under the new Act, and at this early stage of the patent's progress. The questions to which we allude range themselves under this general inquiry:—What is the proper subject-matter for a patent? The only answer which the statute law affords us is—" any new

manufacture." But, further than this, the Judges tell us, that any new adaptation that calls into exercise the inventive faculty (or the power of contriving), to effect such new adaptation, is a patentable invention. Now, it is in cases where there is obviously no power of contrivance called forth, that we would desire to see the law officers exercise that discretionary power which they possess, and refuse, at the outset, protection to all so-called inventions which consist in the obvious substitution of one material for another—as alpaca-cloth, in lieu of silk or cotton, for the covering of umbrellas; or the application of any well-known material to uses which are precisely analogous to those for which that material is commonly employed: of this latter kind of invention, the various adaptations of what is known as India-rubber webbing, afford abundant examples. It is true that patents, when obtained for such inventions, are invalid; but they, nevertheless, not unfrequently serve as a pretext for levying black mail upon manufacturers and retailers in the shape of license-money or royalty; and, in the hands of experienced men, having the reputation for great wealth, and a laudable desire to distribute it among the profession of the law, patents of this kind may be made to produce a nice little steady income, so long as they resort merely to threats, and, at the most, to Chancery proceedings, to maintain their pretended rights. Applications for this kind of patents might, we believe, with great advantage to the public, be disposed of by the Attorney or Solicitor-General; for the grounds on which such applications are based, must be apparent on even a cursory examination of the provisional specification lodged by the applicant. This course will be the more necessary, now that the cost of patents is so greatly reduced, and that an opposition to the grant of a patent can only be maintained (as we last month remarked) on proof either of fraud or prior public use.

Another matter for consideration which the general question—"What is the proper subject-matter for a patent?"—gives rise to, refers to the *amount of* invention that one patent shall be allowed to embrace. On this head the French law is very precise: for Art. 6, says,—"The demand or petition must be confined to one principal object, with the details thereof, pointing out the purposes to which it is applicable." In like manner the practice in the United States' patent office is, to limit the scope of a patent to one useful art, machine, manufacture, or composition of matter: whereas, in this country, the greatest laxity has been shewn in respect of the amount of invention which a patent may include. The present

time we consider a favorable opportunity for remedying the inconvenience which the permission to crowd together a host of ingenious inventions under one patent has given rise to; and we trust that the forthcoming rules of the Commissioners will include a provision for assimilating the practice, under the new law, to that which has been adopted in both France and the United States. The fees for the sealing of a patent being now reduced to £25, there no longer exists an excuse for crowding inventions together; and, as protection is granted as of the day on which it was applied for, no danger can arise from a clear and honest statement, at the outset, of the object of the invention, we trust there will be an end to blind titles, which have hitherto served so effectually to mystify enquirers respecting the nature of existing and expired patents, as well as pending applications. It would appear, judging from the fact that provisional specifications (see Clause XXX.) are to be printed and published, that these documents must be drawn with great care and circumspection; for they must be considered as standing in the same relation to the patent that titles have hitherto held: in other words, it is upon the statement they contain that patents will in future be granted. Thus, if the extent of application of an invention is not realized by the inventor or his agent at the time of depositing this document, or if the modifications of which the invention is susceptible are not embodied therein, it may be impossible to enlarge the scope of his claims in the complete specification. We mention this in order to correct an erroneous impression that may arise from drawing an analogy between the provisional specification required by the Act and the loose indefinite descriptions at present accepted as deposit-papers. Although, for the reason above assigned, it is impossible to state exactly the cost of patents under the new law, yet it is certain that the sums set down in the Schedule will not be much exceeded. The second and third payments, of £50, at the expiration of the third year of the patent's existence, and of £100 at the expiration of the seventh year, may be regarded rather as a tax upon the profits of the invention than an outlay; as it is presumed that, if the patent does not prove lucrative after a three years' trial, it will be abandoned. The payment of a £5 fee on the deposit of the specification, in lieu of the stamp duties and inrolment fees at present required—ranging, together, from £7 to £70, and even occasionally touching £100—also shews a diminution in the cost attendant upon the obtaining of a patent, greater than is obvious at first sight.

It is somewhat difficult to account for the liberality shewn

to inventors by Clauses XXX. and XXXII., which provide for the publication of future specifications, and the preparing and printing of analogical indexes of existing specifications. That it is, in many points of view, very desirable to carry out these provisions, there can be no question; but we fear, that when the expense consequent thereon is discovered, some pretext will be found for setting them aside. The objection of cost might, we think, have been avoided, and the demands of inventors satisfied, had a suggestion, made before the Committee of the House of Lords, been complied with, viz.:—that abstracts or concise reports of all specifications should be printed. This would, indeed, have been done long ago, by private hands, had a disposition been shewn by the officials, at the several enrolment offices, to afford assistance, or even to offer no obstructions to the carrying out of the project. It is well known to our readers that *The London Journal of Arts* was established, in the year 1820, chiefly for the object of laying before the inventive world an account of all improvements which became the subject of letters patent in England; but it is not so generally known that the projector and chief editor of this work, who, from his connection with the enrolment offices, was considered to have peculiar facilities for providing this much desired information, was ultimately compelled to choose one of these two alternatives—either to abandon a lucrative office, which he had long held, or to break off his connection with this Journal. By accepting the first, he has been enabled to lay open a mass of information which would otherwise have been buried among the rolls of Chancery. If the plan of the government should be carried out in its integrity, and thereby supersede the necessity for the reporting of specifications in this Journal, we shall receive no little satisfaction in knowing, that a matter of so great importance to the inventive community as this—which, by the rapid growth of invention, and the consequent increase in the number of patents during the last thirty years, from being once only difficult has long been deemed impossible of execution by private individuals—is now taken up by the only party capable of coping with all the difficulties attendant on the enterprise. Annexed is a copy of the Act, in the form in which it received the Royal assent. The Forms referred to in Clause LIV. are omitted, as being of no interest to the general reader.

WHEREAS, it is expedient to amend the law concerning letters patent for inventions: Be it enacted by the Queen's most excellent Majesty, by and with the advice and consent of the Lords

Spiritual and Temporal, and Commons, in this present Parliament assembled, and by the authority of the same, as follows:—

I. The Lord Chancellor, the Master of the Rolls, Her Majesty's Attorney-General for England, Her Majesty's Solicitor-General for England, the Lord Advocate, Her Majesty's Solicitor-General for Scotland, Her Majesty's Attorney-General for Ireland, and Her Majesty's Solicitor-General for Ireland, for the time being respectively, together with such other person or persons as may be from time to time appointed by Her Majesty, as hereinafter mentioned, shall be Commissioners of Patents for Inventions; and it shall be lawful for Her Majesty, from time to time, by warrant under Her Royal Sign Manual, to appoint such other person or persons, as she may think fit, to be a Commissioner or Commissioners as aforesaid; and every person so appointed shall continue such Commissioner during Her Majesty's pleasure; and all the powers hereby vested in the Commissioners may be exercised by any three or more of them, the Lord Chancellor or Master of the Rolls being one.

II. It shall be lawful for the Commissioners to cause a seal to be made for the purposes of this Act, and from time to time to vary such seal, and to cause to be sealed therewith all the warrants for letters patent under this Act, and all instruments and copies proceeding from the office of the Commissioners; and all courts, judges, and other persons whomsoever shall take notice of such seal, and receive impressions thereof in evidence, in like manner as impressions of the Great Seal are received in evidence, and shall also take notice of and receive in evidence, without further proof or production of the originals, all copies or extracts, certified under the seal of the said office, of or from documents deposited in such office.

III. It shall be lawful for the Commissioners, from time to time, to make such rules and regulations (not inconsistent with the provisions of this Act) respecting the business of their office, and all matters and things which, under the provisions herein contained, are to be under their control and direction, as may appear to them necessary and expedient for the purposes of this Act; and all such rules shall be laid before both Houses of Parliament, within fourteen days after the making thereof, if Parliament be sitting, and if Parliament be not sitting, then within fourteen days after the next meeting of Parliament; and the Commissioners shall cause a report to be laid annually before Parliament of all the proceedings under and in pursuance of this Act.

IV. It shall be lawful for the Commissioners of Her Majesty's Treasury to provide and appoint, from time to time, proper places or buildings for an office or offices for the purposes of this Act.

V. It shall be lawful for the Commissioners, with the consent of the Commissioners of the Treasury, from time to time, to appoint, for the purposes of this Act, such clerks and officers as

the Commissioners may think proper; and it shall be lawful for the Commissioners, from time to time, to remove any of the clerks and officers so appointed.

VI. Every petition for the grant of letters patent for an invention, and the declaration required to accompany such petition, shall be left at the office of the Commissioners; and there shall be left therewith a statement in writing, hereinafter called the provisional specification, signed by or on behalf of the applicant for letters patent, describing the nature of the said invention; and the day of the delivery of every such petition, declaration, and provisional specification shall be recorded at the said office, and endorsed on such petition, declaration, and provisional specification, and a certificate thereof given to such applicant or his agent; and all such petitions, declarations, and provisional specifications shall be preserved in such manner as the Commissioners may direct, and a registry thereof, and of all proceedings thereon, kept at the office of the Commissioners.

VII. Every application for letters patent made under this Act shall be referred by the Commissioners, according to such regulations as they may think fit to make, to one of the law officers.

VIII. The provisional specification shall be referred to the law officer, who shall be at liberty to call to his aid such scientific or other person as he may think fit, and to cause to be paid to such person, by the applicant, such remuneration as the law officer shall appoint; and if such law officer be satisfied that the provisional specification describes the nature of the invention, he shall allow the same, and give a certificate of his allowance; and such certificate shall be filed in the office of the Commissioners, and thereupon, the invention therein referred to may, during the term of six months from the date of the application for letters patent for the said invention, be used and published without prejudice to any letters patent to be granted for the same, and such protection from the consequences of use and publication is hereinafter referred to as provisional protection: provided always, that in case the title of the invention, or the provisional specification, be too large or insufficient, it shall be lawful for the law officer, to whom the same is referred, to allow or require the same to be amended.

IX. The applicant for letters patent for an invention, instead of leaving, with the petition and declaration, a provisional specification, as aforesaid, may, if he think fit, file, with the said petition and declaration, an instrument in writing under his hand and seal (hereinafter called a complete specification), particularly describing and ascertaining the nature of the said invention, and in what manner the same is to be performed,—which complete specification shall be mentioned in such declaration; and the day of the delivery of every such petition, declaration, and complete specification, shall be recorded at the office of the Commissioners, and endorsed on such petition, declaration, and specification, and

a certificate thereof given to such applicant or his agent; and thereupon, subject and without prejudice to the provisions hereinafter contained, the invention shall be protected under this Act for the term of six months from the date of the application; and the applicant shall have, during such term of six months, the like powers, rights, and privileges, as might have been conferred upon him by letters patent for such invention, issued under this Act, and duly sealed as of the day of the date of such application; and, during the continuance of such powers, rights, and privileges, under this provision, such invention may be used and published without prejudice to any letters patent to be granted for the same; and where letters patent are granted in respect of such invention, then, in lieu of a condition for making void such letters patent, in case such invention be not described and ascertained by a subsequent specification, such letters patent shall be conditioned to become void if such complete specification, filed as aforesaid, does not particularly describe and ascertain the nature of the said invention, and in what manner the same is to be performed; and a copy of every such complete specification shall be open to the inspection of the public, as hereinafter provided, from the time of depositing the same, subject to such regulation as the Commissioners may make.

X. In case of any application for letters patent for any invention, and the obtaining, upon such application, of provisional protection for such invention, or of protection for the same, by reason of the deposit of a complete specification, as aforesaid, in fraud of the true and first inventor, any letters patent granted to the true and first inventor of such invention shall not be invalidated by reason of such application, or of such provisional or other protection, as aforesaid, or of any use or publication of the invention subsequent to such application, and before the expiration of the term of such provisional or other protection.

XI. Where any invention is provisionally protected under this Act, or protected by reason of the deposit of such complete specification, as aforesaid, the Commissioners shall cause such provisional protection, or such other protection, as aforesaid, to be advertised in such manner as they may see fit.

XII. The applicant for letters patent—so soon as he may think fit, after the invention shall have been provisionally protected under this Act, or where a complete specification has been deposited with his petition and declaration, then, so soon as he may think fit after such deposit—may give notice, at the office of the Commissioners, of his intention of proceeding with his application for letters patent for the said invention; and thereupon the said Commissioners shall cause his said application to be advertised in such manner as they may see fit; and any persons having an interest in opposing the grant of letters patent for the said invention, shall be at liberty to leave particulars, in writing, of their objections to the said application, at such place, and within such

time, and subject to such regulations as the Commissioners may direct.

XIII. So soon as the time for the delivery of such objections shall have expired, the provisional specification, or complete specification (as the case may be), and particulars of objection (if any) shall be referred to the law officer to whom the application has been referred.

XIV. It shall be lawful for the law officer to whom any application for such letters patent is referred, if he see fit, by certificate under his hand, to order by or to whom the costs of any hearing or inquiry upon any objection, or otherwise—in relation to the grant of such letters patent, or in relation to the provisional (or other) protection acquired by the applicant under this Act—shall be paid, and in what manner, and by whom, such costs are to be ascertained; and if any costs so ordered to be paid be not paid within four days after the amount thereof shall be so ascertained, it shall be lawful for such law officer to make an order for the payment of the same; and every such order may be made a rule of one of Her Majesty's superior courts at Westminster or Dublin, and may be recorded in the books of council and session in Scotland, to the effect that execution may pass thereupon in common form.

XV. It shall be lawful for such law officer, after such hearing, if any, as he may think fit, to cause a warrant to be made for the sealing of letters patent for the said invention; and such warrant shall be sealed with the seal of the Commissioners, and shall set forth the tenor and effect of the letters patent thereby authorized to be granted; and such law officer shall direct the insertion, in such letters patent, of all such restrictions, conditions, and provisos, as he may deem usual and expedient in such grants, or necessary in pursuance of the provisions of this Act; and the said warrant shall be the warrant for the making and sealing of letters patent under this Act, according to the tenor of the said warrant: provided always that the Lord Chancellor shall and may have and exercise such powers, authority, and discretion, in respect to the said warrant, and the letters patent therein directed to be made under this Act, as he now has and might now exercise with respect to the warrant for the issue, under the Great Seal, of letters patent for any invention, and with respect to the making and issuing of such letters patent; and the writ of *scire facias* shall lie for the repeal of any letters patent issued under this Act, in the like cases as the same would lie for the repeal of letters patent which may now be issued under the Great Seal.

XVI. Provided also, that nothing herein contained shall extend to abridge or affect the prerogative of the crown in relation to the granting or withholding the grant of any letters patent; and it shall be lawful for Her Majesty, by warrant under Her Royal Sign Manual, to direct such law officer to withhold such warrant as aforesaid, or that any letters patent, for the issuing whereof he

may have issued a warrant as aforesaid, shall not issue, or to direct the insertion in any letters patent, to be issued in manner herein provided, of any restrictions, conditions, or provisos, which Her Majesty may think fit, in addition to or in substitution for any restrictions, conditions, or provisos, which would otherwise be inserted therein under this Act; and it shall also be lawful for Her Majesty, by like warrant, to direct any complete specification which may have been filed under the provision hereinbefore contained, and in respect of the invention described in which no letters patent may have been granted, to be cancelled, and thereupon the protection, obtained by the filing of such complete specification, shall cease.

XVII. All letters patent for inventions granted under the provisions hereinbefore contained, shall be made subject to the condition that the same shall be void, and that the powers and privileges thereby granted shall cease and determine, at the expiration of three years and seven years respectively, from the date thereof, unless there be paid, before the expiration of the said three and seven years respectively, the sum or sums of money and stamp duties in the schedule to this Act annexed; and the payment of the said sums of money and stamp duties respectively shall be endorsed on the warrant for the said letters patent; and such officer of the Commissioners as may be appointed for this purpose shall issue under the seal of the Commissioners a certificate of such payment, and shall endorse a receipt for the same on any letters patent issued under the authority of the said warrant; and such certificate, duly stamped, shall be evidence of the payment of the several sums respectively.

XVIII. The Commissioners, so soon after the sealing of the said warrant as required by the applicant for the letters patent, shall cause to be prepared letters patent for the invention, according to the tenor of the said warrant; and it shall be lawful for the Lord Chancellor to cause such letters patent to be sealed with the Great Seal of the United Kingdom; and such letters patent so sealed shall extend to the whole of the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man; and in case such warrant so direct, such letters patent shall be made applicable to Her Majesty's colonies and plantations abroad, or such of them as may be mentioned in such warrant; and such letters patent shall be valid and effectual as to the whole of such United Kingdom, and the said islands and isle, and the said colonies or plantations, or such of them as aforesaid, and shall confer the like powers, rights, and privileges, as might, in case this Act had not been passed, have been conferred by several letters patent of the like purport and effect passed under the Great Seal of the United Kingdom, under the seal appointed to be used instead of the Great Seal of Scotland, and under the Great Seal of Ireland respectively, and made applicable to England, the Dominion of Wales, the town of Berwick-upon-Tweed, the Channel Islands,

and Isle of Man, and the said colonies and plantations, or such of them as aforesaid, to Scotland, and to Ireland, respectively, save as herein otherwise provided: provided always, that nothing in this Act contained shall be deemed or taken to give any effect or operation to any letters patent to be granted under the authority of this Act in any colony in which such or the like letters patent would be invalid by the law in force in the same colony for the time being: provided always, that a transcript of such letters shall, so soon after the sealing of the same, and in such manner as the Commissioners shall direct, be transmitted to the Director of Chancery in Scotland, and be recorded in the Records of Chancery in Scotland, upon payment of such fees as the Commissioners shall appoint, in the same manner and to the same effect in all respects as letters patent, passing under the seal appointed by the Treaty of Union to be used in place of the Great Seal of Scotland, have heretofore been recorded; and extracts from the said records shall be furnished to all parties requiring the same, on payment of such fees as the Commissioners shall direct, and shall be received in evidence in all courts in Scotland to the like effect as the letters patent themselves.

XIX. Provided always, that no letters patent, save as hereinafter mentioned in the case of letters patent destroyed or lost, shall issue on any warrant granted as aforesaid, unless application be made to seal such letters patent within three months after the date of the said warrant.

XX. Provided also, that no letters patent (save letters patent issued in lieu of others destroyed or lost) shall be issued or be of any force or effect unless the same be granted during the continuance of the provisional protection under this Act,—or where a complete specification has been deposited under this Act, then unless such letters patent be granted during the continuance of the protection conferred under this Act, by reason of such deposit; save that where the application to seal such letters patent has been made during the continuance of such provisional or other protection as aforesaid, and the sealing of such letters patent has been delayed by reason of a caveat or an application to the Lord Chancellor against or in relation to the sealing of such letters patent, then such letters patent may be sealed at such time as the Lord Chancellor shall direct.

XXI. Provided also, that where the applicant for such letters patent dies during the continuance of the provisional protection, or the protection by reason of the deposit of a complete specification (as the case may be), such letters patent may be granted to the executors or administrators of such applicant during the continuance of such provisional or other protection, or at any time within three months after the death of such applicant, notwithstanding the expiration of the term of such provisional or other protection; and the letters patent so granted shall be of the like force and effect as if they had been granted to such

applicant during the continuance of such provisional or other protection.

XXII. Provided also, that in case any such letters patent shall be destroyed or lost, other letters patent of the like tenor and effect, and sealed and dated as of the same day, may, subject to such regulations as the Commissioners may direct, be issued under the authority of the warrant in pursuance of which the original letters patent were issued.

XXIII. It shall be lawful (the Act of the eighteenth year of King Henry the Sixth, chapter one, or any other Act, to the contrary notwithstanding) to cause any letters patent to be issued in pursuance of this Act to be sealed and bear date as of the day of the application for the same; and in case of such letters patent for any invention provisionally registered under the "Protection of Inventions Act, 1851," as of the day of such provisional registration; or, where the law officer to whom the application was referred, or the Lord Chancellor, thinks fit and directs, any such letters patent as aforesaid may be sealed and bear date as of the day of the sealing of such letters patent, or of any other day between the day of such application or provisional registration and the day of such sealing.

XXIV. Any letters patent issued under this Act, sealed and bearing date as of any day prior to the day of the actual sealing thereof, shall be of the same force and validity as if they had been sealed on the day as of which the same are expressed to be sealed and bear date: provided always, that save where such letters patent are granted for any invention, in respect whereof a complete specification has been deposited upon the application for the same under this Act, no proceeding at law or in equity shall be had upon such letters patent in respect of any infringement committed before the same were actually granted.

XXV. Where, upon any application made after the passing of this Act, letters patent are granted in the United Kingdom for or in respect of any invention first invented in any foreign country, or by the subject of any foreign power or state, and a patent or like privilege, for the monopoly or exclusive use or exercise of such invention in any foreign country, is there obtained before the grant of such letters patent in the United Kingdom, all rights and privileges, under such letters patent, shall (notwithstanding any term in such letters patent limited) cease and be void immediately upon the expiration or other determination of the term during which the patent or like privilege, obtained in such foreign country, shall continue in force, or where more than one such patent or like privilege is obtained abroad, immediately upon the expiration or determination of the term which shall first expire or be determined of such several patents or like privileges: provided always, that no letters patent for or in respect of any invention for which any such patent or like privilege, as aforesaid, shall have been obtained in any foreign country, and which shall be granted in

the said United Kingdom after the expiration of the term for which such patent or privilege was granted, or was in force, shall be of any validity.

XXVI. No letters patent for any invention (granted after the passing of this Act) shall extend to prevent the use of such invention in any foreign ship or vessel, or for the navigation of any foreign ship or vessel, which may be in any port of Her Majesty's dominions, or in any of the waters within the jurisdiction of any of Her Majesty's Courts, where such invention is not so used for the manufacture of any goods or commodities to be vended within or exported from Her Majesty's dominions: provided always, that this enactment shall not extend to the ships or vessels of any foreign state, of which the laws authorize subjects of such foreign state, having patents or like privileges, for the exclusive use or exercise of inventions within its territories, to prevent or interfere with the use of such inventions in British ships or vessels, or in or about the navigation of British ships or vessels, while in the ports of such foreign state, or in the waters within the jurisdiction of its Courts, where such inventions are not so used for the manufacture of goods or commodities to be vended within or exported from the territories of such foreign state.

XXVII. All letters patent, to be granted under this Act (save only letters patent granted after the filing of a complete specification), shall require the specification thereunder to be filed in the High Court of Chancery, instead of requiring the same to be enrolled, and no enrolment shall be requisite.

XXVIII. Every specification, to be filed in pursuance of the condition of any letters patent, shall be filed in such office of the Court of Chancery as the Lord Chancellor shall from time to time appoint; and every provisional specification and complete specification left or filed at the Office of the Commissioners, on the application for any letters patent, shall forthwith, after the grant of the letters patent, or, if no letters patent be granted, then immediately on the expiration of six months from the time of such application, be transferred to and kept in the said office appointed for filing specifications in Chancery; and, in case reference is made to drawings in any specification deposited or filed under this Act, an extra copy of such drawings shall be left with such specification.

XXIX. The Commissioners shall cause true copies of all specifications (other than provisional specifications), disclaimers, and memoranda of alterations, filed under or in pursuance of this Act, and of all provisional specifications, after the term of the provisional protection of the invention has expired, to be open to the inspection of the public at the Office of the Commissioners, and at an office in Edinburgh and Dublin respectively, at all reasonable times, subject to such regulations as the Commissioners may direct; and the Commissioners shall cause a transcript of the said letters patent to be transmitted for enrolment in the Court of

Chancery, Dublin, and shall cause the same to be enrolled therein; and the transcript or exemplification thenceforward shall have the like effect to all intents and purposes as if the original letters patent had been enrolled in the Court of Chancery in Dublin; and all parties shall have all their remedies by *scire facias*, or otherwise, as if the letters patent had been granted to extend to Ireland only.

XXX. The Commissioners shall cause to be printed, published, and sold, at such prices, and in such manner as they may think fit, all specifications, disclaimers, and memoranda of alterations deposited or filed under this Act; and such specifications (not being provisional specifications), disclaimers, and memoranda, respectively, shall be so printed and published as soon as conveniently may be after the filing thereof respectively; and all such provisional specifications shall be so printed and published as soon as conveniently may be after the expiration of the provisional protection obtained in respect thereof; and it shall be lawful for the Commissioners to present copies of all such publications to such public libraries and museums as they may think fit, and to allow the person depositing or filing any such specification, disclaimer, or memorandum of alteration, to have such number, not exceeding twenty-five, of the copies thereof, so printed and published, without any payment for the same, as they may think fit.

XXXI. It shall be lawful for the Lord Chancellor and the Master of the Rolls to direct the enrolment of specifications, disclaimers, and memoranda of alterations heretofore or hereafter enrolled or deposited at the Rolls Chapel Office, or at the Petty Bag Office, or at the Enrolment Office of the Court of Chancery, or in the custody of the Master of the Rolls as keeper of the public records, to be transferred to and kept in the office appointed for filing specifications in Chancery under this Act.

XXXII. The Commissioners shall cause indexes to all specifications, disclaimers, and memoranda of alterations, heretofore or to be hereafter enrolled or deposited as last aforesaid, to be prepared in such form as they may think fit; and such indexes shall be open to the inspection of the public at such place or places as the Commissioners shall appoint, and subject to the regulations to be made by the Commissioners; and the Commissioners may cause all or any of such indexes, specifications, disclaimers, and memoranda of alterations to be printed, published, and sold in such manner and at such prices as the Commissioners may think fit.

XXXIII. Copies, printed by the printers to the Queen's Majesty, of specifications, disclaimers, and memoranda of alterations, shall be admissible in evidence, and deemed and taken to be *primâ facie* evidence of the existence and contents of the documents to which they purport to relate, in all Courts, and in all proceedings relating to letters patent.

XXXIV. There shall be kept at the office appointed for filing

specifications in Chancery under this Act, a book or books, to be called "The Register of Patents," wherein shall be entered and recorded, in chronological order, all letters patent granted under this Act, the deposit or filing of specifications, disclaimers, and memoranda of alterations filed in respect of such letters patent, all amendments in such letters patent and specifications, all confirmations and extensions of such letters patent, the expiry, vacating, or cancelling such letters patent, with the dates thereof respectively, and all other matters and things affecting the validity of such letters patent as the Commissioners may direct; and such register, or a copy thereof, shall be open at all convenient times to the inspection of the public, subject to such regulations as the Commissioners may make.

XXXV. There shall be kept at the office appointed for filing specifications in Chancery under this Act, a book or books, entitled "The Register of Proprietors," wherein shall be entered, in such manner as the Commissioners shall direct, the assignment of any letters patent, or of any share or interest therein, any licence under letters patent, and the district to which such licence relates, with the name or names of any person having any share or interest in such letters patent or licence, the date of his or their acquiring such letters patent, share, and interest, and any other matter or thing relating to or affecting the proprietorship in such letters patent or licence; and a copy of any entry in such book, certified under such seal as may have been appointed or as may be directed by the Lord Chancellor to be used in the said office, shall be given to any person requiring the same, on payment of the fees hereinafter provided; and such copies, so certified, shall be received in evidence in all Courts and in all proceedings, and shall be *primâ facie* proof of the assignment of such letters patent, or share or interest therein, or of the licence or proprietorship, as therein expressed: provided always, that, until such entry shall have been made, the grantee or grantees of the letters patent shall be deemed and taken to be the sole and exclusive proprietor or proprietors of such letters patent, and of all the licences and privileges thereby given and granted; that certified duplicates of all entries made in the said Register of Proprietors shall forthwith be transmitted to the Office of the Commissioners in Edinburgh and Dublin, where the same shall also be open to the inspection of the public; and any writ of *scire facias* to repeal such letters patent may be issued to the sheriff of the county or counties in which the grantee or grantees resided at the time when the said letters patent were granted; and, in case such grantee or grantees do not reside in the United Kingdom, it shall be sufficient to file such writ in the Petty Bag Office, and serve notice thereof, in writing, at the last known residence or place of business of such grantee or grantees; and such register, or a copy, shall be open to the inspection of the public at the Office of the Commissioners, subject to such regu-

lations as the Commissioners may make: provided always, that, in any proceeding in Scotland to repeal any letters patent, service of all writs and summonses shall be made according to the existing forms and practice; provided also that the grantee or grantees of letters patent to be hereafter granted may assign the letters patent for England, Scotland, or Ireland, respectively, as effectually as if the letters patent had been originally granted to extend to England, or Scotland, or Ireland only; and the assignee or assignees shall have the same rights of action and remedies, and shall be subject to the like actions and suits as he or they should and would have had and been subject to upon the assignment of letters patent granted to England, Ireland, or Scotland, before the passing of this Act.

XXXVI. Notwithstanding any proviso that may exist in former letters patent, it shall be lawful for a larger number than twelve persons hereafter to have a legal and beneficial interest in such letters patent.

XXXVII. If any person shall wilfully make, or cause to be made, any false entry in the said Register of Proprietors, or shall wilfully make or forge, or cause to be made or forged, any writing, falsely purporting to be a copy of any entry in the said book, or shall produce or tender, or cause to be produced or tendered, in evidence, any such writing, knowing the same to be false or forged, he shall be guilty of a misdemeanor, and shall be punished by fine and imprisonment accordingly.

XXXVIII. If any person shall deem himself aggrieved by any entry, made under color of this Act, in the said Register of Proprietors, it shall be lawful for such person to apply, by motion, to the Master of the Rolls, or to any of the Courts of Common Law at Westminster in term time, or, by summons, to a judge of any of the said Courts in vacation, for an order that such entry may be expunged, vacated, or varied; and, upon any such application, the Master of the Rolls, or such Court or judge, respectively, may make such order for expunging, vacating, or varying such entry, and as to the costs of such application, as to the said Master of the Rolls or to such Court or judge may seem fit; and the officer having the care and custody of such register, on the production to him of any such order for expunging, vacating, or varying any such entry, shall expunge, vacate, or vary the same, according to the requisitions of such order.

XXXIX. All the provisions of the Acts of the Session holden in the fifth and sixth years of King William the Fourth, chapter eighty-three, and of the Session holden in the seventh and eighth years of Her Majesty, chapter sixty-nine, respectively, relating to disclaimers and memoranda of alterations in letters patent and specifications, except as hereinafter provided, shall be applicable and apply to any letters patent granted, and to any specification filed under the provisions of this Act: provided always, that all applications for leave to enter a disclaimer or memorandum of

alteration shall be made, and all caveats relating thereto shall be lodged at the Office of the Commissioners, and shall be referred to the respective law officers in the said first-recited Act mentioned: provided also, that every such disclaimer or memorandum of alteration shall be filed in the office appointed for filing specifications in Chancery under this Act, with the specification to which the same relates, in lieu of being entered or filed and enrolled as required by the said first-recited Act, or by the Act of the Session holden in the twelfth and thirteenth years of Her Majesty, chapter one hundred and nine, and the said Acts shall be construed accordingly: provided also, that such filing of any disclaimer or memorandum of alteration, in pursuance of the leave of the law officer in the first-recited Act mentioned, certified as therein mentioned, shall, except in cases of fraud, be conclusive as to the right of the party to enter such disclaimer or memorandum of alteration under the said Acts and this Act; and no objection shall be allowed to be made in any proceeding upon or touching such letters patent, specification, disclaimer, or memorandum of alteration, on the ground that the party entering such disclaimer or memorandum of alteration had not sufficient authority in that behalf: provided also, that no action shall be brought upon any letters patent, in which or on the specification of which any disclaimer or memorandum of alteration shall have been filed, in respect of any infringement committed prior to the filing of such disclaimer or memorandum of alteration, unless the law officer shall certify in his fiat that any such action may be brought, notwithstanding the entry or filing of such disclaimer or memorandum of alteration.

XL. All the provisions of the said Act of the fifth and sixth years of King William the Fourth, for the confirmation of any letters patent, and the grant of new letters patent, and all the provisions of the said Act, and of the Acts of the Session holden in the second and third years of Her Majesty, chapter sixty-seven, and of the Session holden in the seventh and eighth years of Her Majesty, chapter sixty-nine, respectively, relating to the prolongation of the term of letters patent, and to the grant of new letters patent for a further term, shall extend and apply to any letters patent granted under the provisions of this Act; and it shall be lawful for Her Majesty to grant any new letters patent, as in the said Acts mentioned; and, in the granting of any such new letters patent, Her Majesty's order in council shall be a sufficient warrant and authority for the sealing of any new letters patent, and for the insertion in such new letters patent of any restrictions, conditions, and provisions in the said order mentioned; and the Lord Chancellor, on the receipt of the said order in council, shall cause letters patent, according to the tenor and effect of such order, to be made and sealed in the manner herein directed for letters patent issued under the warrant of the law officer: provided always, that such new letters patent shall extend to and be available in and for such places as the original letters patent

extended to and were available in: provided also, that such new letters patent shall be sealed and bear date as of the day after the expiration of the term of the original letters patent which may first expire.

XLI. In any action in any of Her Majesty's Superior Courts of Record at Westminster or in Dublin, for the infringement of letters patent, the plaintiff shall deliver with his declaration particulars of the breaches complained of in the said action, and the defendant, on pleading thereto, shall deliver with his pleas, and the prosecutor, in any proceedings by *scire facias* to repeal letters patent, shall deliver with his declaration, particulars of any objections on which he means to rely at the trial in support of the pleas in the said action, or of the suggestions of the said declaration in the proceedings by *scire facias* respectively; and at the trial of such action or proceeding by *scire facias*, no evidence shall be allowed to be given in support of any alleged infringement or of any objection impeaching the validity of such letters patent which shall not be contained in the particulars delivered as aforesaid: provided always, that the place or places at or in which and in what manner the invention is alleged to have been used or published prior to the date of the letters patent shall be stated in such particulars: provided also, that it shall and may be lawful for any Judge at Chambers to allow such plaintiff, or defendant, or prosecutor, respectively, to amend the particulars delivered as aforesaid, upon such terms as to such Judge shall seem fit: provided also, that at the trial of any proceeding by *scire facias* to repeal letters patent, the defendant shall be entitled to begin and to give evidence in support of such letters patent, and in case evidence shall be adduced on the part of the prosecutor impeaching the validity of such letters patent, the defendant shall be entitled to the reply.

XLII. In any action in any of Her Majesty's Superior Courts of Record at Westminster and in Dublin, for the infringement of letters patent, it shall be lawful for the Court in which such action is pending, if the Court be then sitting, or if the Court be not sitting, then for a judge of such Court, on the application of the plaintiff or defendant respectively, to make such order for an injunction, inspection, or account, and to give such direction respecting such action, injunction, inspection, and account, and the proceedings therein respectively, as to such Court or judge may seem fit.

XLIII. In taxing the costs in any action in any of Her Majesty's Superior Courts at Westminster or in Dublin, commenced after the passing of this Act, for infringing letters patent, regard shall be had to the particulars delivered in such action; and the plaintiff and defendant, respectively, shall not be allowed any costs in respect of any particular, unless certified by the judge, before whom the trial was had, to have been proved by such plaintiff or defendant respectively, without regard to the general costs of the cause; and it shall be lawful for the judge, before

whom any such action shall be tried, to certify on the record that the validity of the letters patent, in the declaration mentioned, came in question; and the record, with such certificate, being given in evidence in any suit or action for infringing the said letters patent, or in any proceeding by *scire facias* to repeal the letters patent, shall entitle the plaintiff in any such suit or action, or the defendant in such proceeding by *scire facias*, on obtaining a decree, decretal order or final judgment, to his full costs, charges, and expenses, taxed as between attorney and client, unless the judge making such decree or order, or the judge trying such action or proceeding, shall certify that the plaintiff or defendant, respectively, ought not to have such full costs: provided always, that nothing herein contained shall affect the jurisdiction and forms of process of the Courts in Scotland, in any action for the infringement of letters patent, or in any action or proceeding respecting letters patent, hitherto competent to the said Courts: provided also, that, when any proceedings shall require to be taken in Scotland to repeal any letters patent, such proceedings shall be taken in the form of an action of reduction at the instance of Her Majesty's advocate, or at the instance of any other party having interest, with concurrence of Her Majesty's advocate,—which concurrence Her Majesty's advocate is authorized and empowered to give upon just cause shewn only.

XLIV. There shall be paid, in respect of letters patent applied for or issued as herein mentioned, the filing of specifications and disclaimers, certificates, entries, and searches, and other matters and things mentioned in the schedule to this Act, such fees as are mentioned in the said schedule; and there shall be paid unto and for the use of Her Majesty, her heirs, and successors, for or in respect of the warrants and certificates mentioned in the said schedule, or the vellum, parchment, or paper, on which the same respectively are written, the stamp duties mentioned in the said schedule; and no other stamp duties shall be levied, or fees, except as hereinafter mentioned, taken in respect to such letters patent and specifications, and the matters and things in such schedule mentioned.

XLV. The stamp duties hereby granted shall be under the care and management of the Commissioners of Inland Revenue; and the several rules, regulations, provisions, penalties, clauses, and matters contained in any Act, now or hereafter to be in force with reference to stamp duties, shall be applicable thereto.

XLVI. The fees to be paid as aforesaid shall from time to time be paid into the receipt of the Exchequer, and be carried to and made part of the Consolidated Fund of the United Kingdom.

XLVII. Provided always, that nothing herein contained shall prevent the payment as heretofore to the law officers, in cases of opposition to the granting of letters patent, and in cases of disclaimers and memoranda of alterations, of such fees as may be appointed by the Lord Chancellor and Master of the Rolls as the fee to be paid on the hearing of such oppositions, and in the

case of disclaimers and memoranda of alterations respectively; or of such reasonable sums for office or other copies of documents in the office of the Commissioners, as the Commissioners may from time to time appoint to be paid for such copies; and the Lord Chancellor and Master of the Rolls, and the Commissioners, are hereby respectively authorized and empowered to appoint the fees to be so paid in respect of such oppositions, disclaimers, and memoranda of alterations respectively, and for such office or other copies.

XLVIII. It shall be lawful for the Commissioners of Her Majesty's Treasury, from time to time, to allow such fees to the law officers and their clerks (for duties under this Act, in respect of which fees may not be payable to them under the provisions lastly hereinbefore contained), as the Lord Chancellor and Master of the Rolls may from time to time appoint, and to allow such salaries and payments to any clerks and officers to be appointed under this Act, and such additional salaries and payments to any other clerks and officers, in respect of any additional duties imposed on them by this Act, as the said Commissioners of the Treasury may think fit.

XLIX. It shall be lawful for the Commissioners of Her Majesty's Treasury to allow, from time to time, the necessary sums for providing offices under this Act, and for the fees, salaries, and payments allowed by them as aforesaid, and for defraying the current and incidental expenses of such office or offices; and the sums to be so allowed shall be paid out of such monies as may be provided by Parliament for that purpose.

L. And whereas, divers persons, by virtue of their offices or appointments, are entitled to fees or charges payable in respect of letters patent, as heretofore granted within the United Kingdom of Great Britain and Ireland, or have and derive in respect of such letters patent, or the procedure for the granting thereof, fees or other emoluments or advantages :—

It shall be lawful for the said Commissioners of the Treasury to grant to any such persons who may sustain any loss of fees, emoluments, or advantages, by reason of the passing of this Act, such compensation as, having regard to the tenure and nature of their respective offices and appointments, such Commissioners deem just and proper to be awarded; and all such compensations shall be paid out of such monies as may be provided by Parliament for that purpose: provided always, that in case any person to whom any yearly sum by way of compensation shall be awarded and paid shall, after the passing of this Act, be appointed to any office or place of emolument under the provisions of this Act, or in the public service, then, and in every such case, the amount of such yearly sum shall in every year be diminished by so much as the emoluments of such person for such year from such office or place shall amount to, and provision in that behalf shall be made in the award to him of such yearly sum.

LI. An account of all salaries, fees, allowances, sums, and

compensations to be appointed, allowed, or granted under this Act shall, within fourteen days next after the same shall be so appointed, allowed, or granted respectively, be laid before both Houses of Parliament, if Parliament be then sitting, or if Parliament be not then sitting, then within fourteen days after the next meeting of Parliament.

LII. Letters patent may be granted in respect of applications made before the commencement of this Act, in like manner and subject to the same provisions as if this Act had not been passed.

LIII. Where letters patent for England, or Scotland, or Ireland, have been granted before the commencement of this Act, or are in respect of any application made before the commencement of this Act, hereafter granted for any invention, letters patent for England, or Scotland, or Ireland, may be granted for such invention, in like manner as if this Act had not been passed: provided always that, in lieu of all the fees or payments, and stamp duties now payable in respect of such letters patent, or in or about obtaining a grant thereof, there shall be paid, in respect of such letters patent, for England, or Scotland, or Ireland, on the sealing of such respective letters patent, a sum equal to one-third part of the fees and stamp duties which would be payable, according to the schedule to this Act, in respect of letters patent issued for the United Kingdom, under this Act, on or previously to the sealing of such letters patent; and at or before the expiration of the third year and the seventh year respectively, of the term granted by such letters patent for England, or Scotland, or Ireland, sums equal to one-third part of the fees and stamp duties payable at the expiration of the third year and the seventh year respectively, of the term granted by letters patent issued for the United Kingdom under this Act; and the condition of such letters patent for England, or Scotland, or Ireland, shall be varied accordingly; and such fees shall be paid to such persons as the Commissioners of Her Majesty's Treasury shall appoint, and shall be carried to and form part of the said Consolidated Fund.

LIV. The several forms in the schedule to this Act may be used for, and in respect of, the several matters therein mentioned, and the Commissioners may, where they think fit, vary such forms, as occasion may require, and cause to be printed and circulated such other forms as they may think fit, to be used for the purposes of this Act.

LV. In the construction of this Act, the following expressions shall have the meanings hereby assigned to them, unless such meanings be repugnant to or inconsistent with the context: that is to say—

The expression, "Lord Chancellor," shall mean the Lord Chancellor, or Lord Keeper of the Great Seal, or Lords Commissioners of the Great Seal:

The expression, "The Commissioners," shall mean the Com-

missioners for the time being acting in execution of this Act:

The expression, "Law Officer," shall mean Her Majesty's Attorney-General or Solicitor-General for the time being for England, or the Lord Advocate, or Her Majesty's Solicitor-General for the time being for Scotland, or Her Majesty's Attorney-General or Solicitor-General for the time being for Ireland:

The expression, "Invention," shall mean any manner of new manufacture, the subject of letters patent and grant of privilege within the meaning of the Act of the twenty-first year of the reign of King James the First, chapter three:

The expressions, "Petition," "Declaration," "Provisional Specification," "Warrant," and "Letters Patent," respectively, shall mean instruments in the form and to the effect in the schedule hereto annexed, subject to such alterations as may, from time to time, be made therein under the powers and provisions of this Act.

LVI. In citing this Act in other Acts of Parliament, instruments, and proceedings, it shall be sufficient to use the expression, "The Patent Law Amendment Act, 1852."

LVII. This Act shall commence and take effect from the first day of October, one thousand eight hundred and fifty-two.

THE SCHEDULE TO WHICH THIS ACT REFERS.

Fees to be Paid.

	£	s.	d.
On leaving petition for grant of letters patent	5	0	0
On notice of intention to proceed with the application	5	0	0
On sealing of letters patent	5	0	0
On filing specification..........................	5	0	0
At or before the expiration of the third year........	40	0	0
At or before the expiration of the seventh year......	80	0	0
On leaving notice of objections	2	0	0
Every search and inspection	0	1	0
Entry of assignment or licence	0	5	0
Certificate of assignment or licence	0	5	0
Filing application for disclaimer	5	0	0
Caveat against disclaimer	2	0	0

Stamp Duties to be Paid.

On warrant of law officer for letters patent	5	0	0
On certificate of payment of the fee payable at or before the expiration of the third year	10	0	0
On certificate of payment of the fee payable at or before the expiration of the seventh year	20	0	0

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

(Continued from page 73.)

A paper by Mr. J. E. McConnell, of Wolverton, "*On a new portable lifting-machine*," was next read.

The object of this machine (which is the invention of Mr. Long, hydrometer maker, London), is to obtain, in a portable and simple form, the means of multiplying the power of a man to a very great extent, for the purpose of lifting weights, &c., without the draw-back of heavy friction and wear to which some lifting machines are liable—such as those in which an endless screw works into a toothed wheel. A specimen of this machine was exhibited to the meeting. It consists, firstly, of a wheel, on the periphery of which eleven pins are fixed in the form of teeth, with a friction-roller fitted upon each pin; and the wheel is mounted on a horizontal shaft. At right angles to the wheel, there stands a circular plate, which is fixed upon another horizontal shaft, furnished with a winch-handle. The circular plate is cast with a spiral projecting piece, which makes rather more than one turn upon the face of the plate. This spiral engages with the pins of the pin-wheel; and the difference in the amount of excentricity of the two ends of the spiral is equal to the pitch or distance between the pins; so that, when the plate and spiral are turned round one revolution by the handle, the wheel is driven round the distance of one pin or tooth. The driving-face of the spiral has a varying bevil, adjusted so as to bear fairly and uniformly upon each pin in succession throughout the entire revolution, as the pin varies its inclination. The spiral is of such thickness as nearly to fill the space between the two pins at all times,—preventing any slip; and the upper pin is engaged a short distance before the lower one is released. The friction-roller upon the pin turns round during the motion, rolling, with little friction, along the inner surface of the spiral, which forms an inclined plane, with an inclination of about 1 in 7. A pinion fixed on the shaft of the pin-wheel gears into one of three times its diameter on a third horizontal shaft, upon which is fixed a drum for winding up the rope or chain attached to the weight to be lifted. The leverage of the spiral and first wheel being 11 to 1, and that of the spur gearing 3 to 11, makes a power of 33 to 1; and the radius of the winch-handle and of the drum being 6 to 1, the total increase of power obtained by the machine is 200 to 1 very nearly; or, one man exerting a power of ½ cwt. at the winch, could lift five tons, including the friction.

This machine has the advantage of reducing the friction, in consequence of the rubbing action being confined to the revolving of the friction-rollers upon their axles, instead of the inclined plane rubbing upon the pins, or the thread of an endless screw

rubbing upon the teeth of a worm-wheel, which has only contact at little more than a line. This has a scraping action, tending constantly to remove the oil from the surface; but in the friction-rollers there is a much larger surface in contact to bear the pressure; and this surface being always in contact, never has the oil scraped off the surface, and can retain the oil for a much longer time.

The same principle may be applied to vices, by causing the projecting spiral to act upon the teeth of a straight rack, connected to the sliding jaw of a parallel vice.

Another application was also shewn to a rack-pulley for a window-blind cord, in which the pulley could be conveniently tightened, or slackenened, or removed, as required, and was held in its place by the spiral.

In the library, M. Bourdon, from Paris, exhibited several varieties of his manometer, or pressure-gauge, for steam boilers and other purposes, with a series of models, illustrating the principle on which the instrument is constructed;—namely, a flattened metallic tube, bent into a circular curve, and acted upon in the interior by the pressure of the steam, &c., causing the curvature to diminish, and the detached end of the tube to move in proportion to the degree of pressure, and indicate the pressure by moving the index on the dial. A portable barometer was exhibited, constructed on the same principle, and similar in form to the aneroid barometer. Also, an ingenious instrument for measuring velocity of rotation, founded on a property of the peculiar form of curved tube that was employed in the above instruments, to increase its internal capacity in proportion to the diminution of its curvature: this instrument was proposed to be brought before the Institution in a more complete form.

Mr. Follett Osler, of Birmingham, exhibited to the members an extensive series of diagrams, taken from his new compound self-registering anemometer, fixed at the Liverpool Observatory. This instrument is a further improvement on the former self-registering anemometer constructed by Mr. Osler, and erected at the Birmingham Philosophical Institution in 1840. In this instrument, in addition to the constant record of the direction and force of the wind, by two lines, traced by the instrument itself, upon a continuously moving sheet of paper, the velocity is recorded by a third line, and the quantity by a fourth line. The direction and force are recorded by two pencils upon one flat sheet of paper, which is changed every day, and is fixed on a table, moved at a uniform rate by a clock, and having the successive hours, &c., marked upon it. The direction pencil is moved in a straight line across the paper by means of a quick-threaded screw geared to the wind-vane, tracing on the paper a waving longitudinal line—the paper being ruled longitudinally, by fixed pencils, to mark the cardinal points: the wind-vane is similar to the fan-wheel at the back of a windmill. The pressure-pencil is moved

transversely upon the paper, by connection, through wires, with the pressure-plate, which is a circular disc, four square feet in area, held always at right angles to the direction of the wind, so as to receive the full pressure upon springs at the back, which yield according to the degree of pressure. A fixed pencil rules the datum-line upon the paper.

The velocity and quantity are recorded on a continuous sheet of paper, moved by the wind itself, at a rate exactly proportionate to the velocity of the wind,—the successive hours being marked upon the paper, whilst passing, by means of a punch, which is in connection with the clock, and strikes a blow on the arrival of each hour. The distances between these successive hour-marks on the paper, give, consequently, by a scale, the measure of the velocity of the wind at each time; and the total length of the paper that is passed in an hour or a day, gives the measure of the total quantity of air that has passed the place during the time,—one inch of the paper representing thirty-eight miles of air. The length of one sheet of paper was thirty-one feet, for the month of January last,—representing that the total quantity of 14,000 miles of air had travelled past the place during the time,—that quantity being the sum of all the currents of air, in all directions, at that particular place. The motion of this paper is obtained from a vertical spindle, which has four horizontal arms, three feet long, fixed on the top, at right angles to each other; and each arm carries, at its extremity, a hemispherical cup, eight inches in diameter, fixed vertically; so that when one presents its hollow side to the wind, the opposite one presents its convex side in the same direction. The moving power of the wind upon the convex side is only half as great as its power on the hollow side, and, consequently, the whole instrument is caused to revolve; but as the hollow side moves with the wind, and the other against it, the result is, that the instrument revolves at the rate of one-third the velocity of the current of air. (This plan was originally discovered by Mr. Edgeworth, and first applied to anemometers, by Dr. Robinson.) For the purpose of ascertainining the variations in the velocity of the current, when an unusually large quantity of air is passing, as in the case of a storm, there is an additional marking apparatus, which can be thrown into gear with the clock, and strike a mark on the paper at every minute, or five minutes, or quarter of an hour, as desired, during the continuance of the storm, and be then discontinued, when the velocity of the paper is sufficiently diminished. This instrument is the first that has been constructed of this compound kind; and it has continued in constant work for about half a year with entire success: it has stood, without any injury or derangement, the trial of a very severe storm, on 9th January last, when the pressure of the wind reached to 29 lbs. per square foot, as recorded on one of the sheets exhibited, and the greatest velocity was 62 miles per hour.

Mr. Edwin Cotterill exhibited his improved bank lock, and a number of specimens of different ingenious applications of the principle of his lock. The large bank lock consists of a series of 24 radiating steel slides, which move in radiating channels in the main barrel of the lock; and each slide is pressed to the centre-pin by a separate spiral spring. A circular groove is cut in the face of the barrel and of the slides (when the slides are forced outwards to their right positions by the insertion of the key); so that a continuous circular channel is formed by the coincidence of the different portions of the groove in the face of the barrel and the notches so cut in the several slides. Into this circular channel there enters a notched ring, which is fixed to the top frame of the lock, and remains stationary, whilst the barrel, with the set of slides and springs, revolves with the key. But when the key is withdrawn, each of the slides is forced in different degrees towards the centre by its spiral spring,—sliding also through the several notches in the fixed ring, so that their solid portions intercept the groove in the barrel; and in this position the barrel is held fast by the fixed ring, and the lock is prevented from turning. The key consists of a cylindrical stem, having a series of radiating grooves cut in its circumference, corresponding to the slides in the lock: these grooves are inclined in the bottom, and they all vary in depth, length, and the angle formed by their bottom with the axis of the key. When placed in the lock, for the purpose of opening it, the key is pressed down to the bottom, and each slide entering one of the grooves of the key, they are forced outwards by the inclined bottom of the grooves to various distances, according to the depth and form of the grooves; then, on the key being pressed home, the notches in all the slides exactly coincide with the circular groove in the barrel, leaving a clear passage for the notched ring; and the barrel, with all the slides, is then turned round with the key, by means of the projecting bits on the key. Should an attempt be made to open the lock with a false key, one or more of the slides would be pushed too far, or not far enough, and then it would intercept the circular groove, and prevent the barrel from turning, by locking it fast with the fixed ring. The revolution of the barrel causes all the bolts of the lock to be thrown, through the medium of a toothed ring, fixed upon the outside of the barrel, and working into a toothed wheel, on the axis of which is a pinion, that turns another toothed wheel; this last wheel gives motion to a large toothed ring, which revolves loose upon the barrel and gears into and drives fifteen other toothed wheels, placed at equal distances around it; and these wheels (sixteen in all) each throw a separate bolt, by the teeth thereof acting upon a series of pins, forming a kind of rack upon the bolt. There is also an arrangement for closing the key-hole, by means of a drop-plate, which is capable of being locked by a second key.

The second key is a complete counterpart of the main key, on a

smaller scale, and acts upon a complete lock on the same principle, with six radiating slides, and having the key-hole closed by a drop-plate, in the same manner. Before the main lock can be opened, the second key has to be turned once round to open its own key-hole, by moving aside the drop-plate; and it is then pressed home to move the slides in its lock to the right position, for enabling the key to turn a second time and unlock the drop-plate of the main key-hole. The main key is now put in, and by the first revolution, in the same manner, opens its key-hole and is then pressed home; and by a second turn the lock is opened. This operation, though apparently complicated, is in in reality as simple as unlocking two successive doors of the bank safe, both having been double-locked; but by this plan extreme security is obtained, as a lock of great security has first to be picked, before the key-hole of the main lock can be opened, and any steps taken towards picking it.

A further security is obtained by means of a detector slide, which is attached to one or more of the slides in the lock, so that if any one of those slides is pressed out too far by a false key, or otherwise, although the slide were brought back to its right place, the detector slide would remain projecting into the circular groove, forming an effectual obstruction to the revolution of the barrel; and this obstruction could not be removed even by the right key in the ordinary manner (thereby detecting the attempt on the lock), until the key was first turned backwards for a certain distance, which draws back the detector slide into its place, and restores the lock to its ordinary state. The keys are cut by a machine for the purpose, which admits of being varied, whilst working, to such an extent that the key of every lock is made different,—two only being cut alike, as duplicates for each lock. The key is made first in each case, and the lock is formed to the key, by the slides being fitted to the key,—the circular groove in the barrel and slides being cut simultaneously whilst the key is in its place. The form of the grooves of the key gives it the peculiar advantage that an impression cannot be taken from it; and the difficulty of making a correct duplicate of the key is so extreme (except by the original cutting machine whilst adjusted to cut each groove of the first key), as to prevent risk of the key being copied. The slides being firmly guided in the grooves of the barrel, and the key-hole securely closed by the drop-plate, protects the lock effectually from injury by violence from gunpowder or otherwise.

The Special General Meeting of the Members was held at the rooms of the Society of Arts, John-st., Adelphi, 29th June, 1852. J. McConnell, Esq., Vice-President, in the Chair.

A paper by Mr. Andrew J. Robertson, of London, "*On the mathematical principles involved in the centrifugal pump,*" was read.

The writer states, that it is unnecessary, for the present pur-

pose, to enter into any description of the details of these pumps. Their form may be varied according to circumstances: for instance, they may have one, two, or six arms. In discussing the general principle, it will be sufficient to take a form which, while it embodies the principle completely, will serve to set it in the clearest light.

The pump may, then, be said to be composed of a horizontal arm or pipe, forming a continuation of a vertical pipe, that dips into a cistern, from which the water is required to be raised,—the whole being supported in such a manner that the vertical pipe constitutes an axis, about which the machine is made to revolve, by means of a steam-engine acting on a crank at the top thereof. Suppose that the arm is filled with water, and is in motion: then the water contained in the arm has a centrifugal force, the amount of which depends upon the angular velocity with which it is revolving. It is manifest that this velocity must be such as to produce a centrifugal force equal to the weight of a column of water of the same section as the arm, and of a length equal to the height of the discharge-pipe above the surface of the water in the cistern, in order that the column of water in the vertical pipe may be supported. When this velocity increases, the centrifugal force is in excess, and the water flows through the arm, and is delivered into a conduit to take it off. The amount of this delivery depends, therefore, upon the excess of the angular velocity above that required to keep the arm full.

The question now to be examined is, what is the power required to drive this pump, and what is the useful effect, estimated by the product of the quantity delivered, by the height which it is raised.

Let a, be the angular velocity of the arm.

R, the length of the arm in feet, and, consequently, the radius of the circle described by the extremity.

G, the distance in feet of the centre of gravity of the water contained in the arm from the centre.

Let the area of the section be constant throughout its length, and equal to unity, and let w, be the weight of the water contained in one foot of the arm.

$$\text{Then the whole weight } W = Rw, \text{ and } G = \frac{R}{2}$$

$$\text{And the centrifugal force} = \frac{a^2}{g} WG = \frac{a^2 R^2}{2g} w$$

Or, for the sake of simplicity—

$$\text{Let } w = 1, \text{ then the centrifugal force} = \frac{a^2 R^2}{2g}$$

Now a R is the actual velocity with which the outer end of the arm is moving, and $\frac{a^2 R^2}{2g}$ is the height due to that velocity.

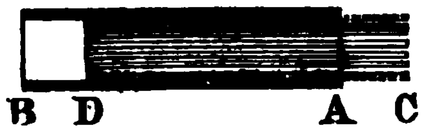
The centrifugal force of the water is therefore represented by

the weight of a column of water of equal section with the arm, and of a height equal to that due to the velocity of the end of the arm; and the part of this column, which is effective in producing a flow through the arm, is the excess of the height of this column above the height of the orifice of discharge, reckoned from the surface of the water in the cistern.

What then is the velocity of flow so produced?

In estimating the effect of the centrifugal force, the velocity required to be communicated to the water in the vertical pipe may be neglected for the present; because, by increasing the area of its section relatively to that of the arm, it may be reduced considerably; and, for the sake of simplicity, it may be considered as nothing. This subject will be alluded to hereafter.

Let AB, in the accompanying diagram, be a pipe of equal section throughout. Let the water in it be in motion. After a small period of time, the water which occupied the space AB will occupy the space CD. The portion CA drops off, and an equal quantity of water DB, at rest, is added. The portion DB, is put in motion suddenly, by virtue of its continuity with the water in AD; but in thus being put in motion, it re-acts upon the water in AD, and checks its velocity. Now, suppose that, instead of being added at rest, DB, had a motion equal to that of the bulk of the water, no retardation would be produced; and conversely, if that water be moving through the arm with the velocity with which the portion DB can be constantly added, that velocity will be maintained uniform. But the velocity with which DB can be added, is that due to the head of water acting on the arm; and therefore the velocity of flow is that due to the excess of the column representing the centrifugal force above the length of the vertical pipe.

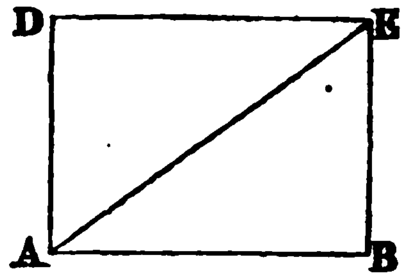


If h be the length of the vertical pipe, then $\frac{a^2 R^2}{2g} - h$ is the effective head, and the velocity of flow is $\sqrt{2g\left\{\frac{a^2 R^2}{2g} - h\right\}} = \sqrt{a^2 R^2 - 2gh}$. Let the velocity of the water at the end of the arm be V, and that due to the length of vertical pipe $h = v$, then the velocity of flow $= \sqrt{V^2 - v^2}$; and, since the area of the section of the arm is unity, the discharge per second is also represented by the same expression $\sqrt{V^2 - v^2}$.

Next—to estimate the amount of power required to be expended upon the machine to produce this discharge:—

Every particle of the water contained in the arm has the same circular motion as the part of the arm it is in. The water, therefore, as it leaves the arm, has a velocity equal to that of the outer end; and its direction would be a tangent to the circle described by the end. But it has also a velocity (that of the discharge) in the direction of the length of the arm, or the radius of the circle. Its actual motion, therefore, in magnitude and direction, will be

represented by the diagonal AE of the parallelogram ABED (in the accompanying diagram), one side of which, AD, represents the first velocity above mentioned, and AB or DE the other. What we are concerned about at present is the amount only of this velocity.



$$AE^2 = ED^2 + AD^2 = AB^2 + AD^2 = (V^2 - v^2) + V^2 = V^2 - v^2.$$

The number of units of work accumulated in a body moving with a given velocity (which is the power required to be expended to produce that velocity) is represented by the formula—

$$U = \frac{1}{2}\frac{w}{g}v_1^2$$

where v_1 is the velocity, and w the weight.

$$\text{In the present case } v_1^2 = 2V^2 - v^2$$

$$w = \text{discharge per second} = \sqrt{V^2 - v^2}$$

$$\therefore U_1 = \frac{(2V^2 - v^2)\sqrt{V^2 - v^2}}{2g}$$

But not only is the water now in motion which was formerly at rest, but it is in motion at a higher level. The total number of units of work which must therefore have been done upon the machine, is the sum of the number of units expended in producing motion, and the number expended in raising the water to the height h, or $\frac{v^2}{2g}$, which is represented by

$$U_2 = \frac{v^2}{2g}\sqrt{V^2 - v^2}$$

Therefore the total power expended is equal to

$$U_1 + U_2 = \frac{V^2}{g}\sqrt{V^2 - v^2}$$

or the power expended on the machine is measured by the quantity of water delivered, raised to twice the height due to the velocity of the circumference of the arm.

As to the useful effect produced, it is simply the water delivered raised to the height h, or $\frac{v^2}{2g}\sqrt{V^2 - v^2}$.

Since a body in motion is, theoretically, always capable of raising itself to a height due to the velocity, it will be clear that the water, when delivered with considerable velocity, must be capable of doing work, either by impinging upon a machine to which it might communicate motion, or by raising itself to an additional height; and if the power thus inherent in the water could be taken advantage of without interfering with the discharge, the result would be, that the useful effect would equal the power expended,—supposing, for argument's sake, that friction, and such causes of loss, did not exist.

But there are great practical difficulties in the way of recovering power from water in motion. The useful effect of an under-

shot water-wheel is only 33 per cent; and then the water flows with a full body in a confined channel; but, in the centrifugal pump, it flies off from all parts of the circumference of a circle. Had the direction of the motion been that of the radius of the circle, a dish, of a curved shape, would have guided the water as it flowed from the arm; and it might have been delivered into a trough at a higher level. Even then, the friction of the surface of this dish would greatly diminish the velocity, and, consequently, the power of rising; but, unfortunately, as has been shewn, the direction is that of the diagonal of the parallelogram AE; from which it will be evident that the length of the path which must be described by the water before the trough could be reached, must be very much greater than in the case supposed above.

We must, therefore, come to the conclusion, that unless some means can be devised of recovering the power of the motion of the water, it must be thrown away, and consequently lost; for it is only by misapplication or waste that power can correctly be said to be lost,—action and reaction being always equal.

The amount of this loss or waste of power is, then—

$$\frac{V^2\sqrt{V^2-v^2}}{g} - \frac{v^2}{2g}\sqrt{V^2-v^2} = \frac{2V^2-v^2}{2g}\sqrt{V^2-v^2}$$

The expression vanishes, or the loss is nothing, when $v = V$, or when the delivery is nothing: that is, when the velocity of the circumference is that due to the height h, of the arm above the water.

$$\text{Since the total power expended is } \frac{V^2}{g}\sqrt{V^2-v^2}$$

$$\text{And the useful effect is} \ldots\ldots\ldots \frac{v^2}{2g}\sqrt{V^2-v^2}$$

$$\text{The per-centage of useful effect is } 100\,\frac{\frac{v^2}{2g}}{\frac{2V^2}{2g}} = \frac{v^2}{2V^2} \times 100$$

or the height to which the water is raised, divided by twice the height due to the velocity of the circumference of the arm.

Suppose, then, a pump required to throw a certain quantity of water, the velocity, through the arm, may evidently be made very little, if the section be large; and the limit to which this enlargement of the section may be carried is imposed only by practical convenience. In this case, v^2, is but little less than V^2, and may be taken as equal in the left-hand factor of the expression for the waste of power, which then becomes—

$$\text{Waste of power } \ldots\ldots = \frac{1}{2}\frac{V^2}{g}\sqrt{V^2-v^2}$$

$$\text{Total power expended} = \frac{V^2}{g}\sqrt{V^2-v^2}$$

or the waste is exactly one-half the power expended.

Thus we see, that the limit to which an approximation may be made, but which can never be practically realized, is, that the useful effect should be half the power, or 50 per cent.

In the foregoing investigation, the horizontal arm has been considered, for the sake of simplicity, to be situated at the upper extremity of the vertical pipe. In practice, it is usually more convenient to place it in an intermediate position, having part of the column above, and part below: this, however, does not affect the principle of the investigation.

Hitherto, the power absorbed by the velocity required to be communicated to each particle of water, as it leaves the cistern and rises in the vertical pipe, has been neglected; nor is it necessary to assign a definite value to it. By enlarging the vertical pipe, it may be greatly reduced: but as it can never be removed entirely, it constitutes one item of that loss which has to be deducted from the theoretical limit of 50 per cent. There is, again, the friction of water in passing through the vertical pipe, and the horizontal arm; and, lastly, there is the friction of the machine itself.

In Whitelaw's mill, where a head of water is employed as a source of power, and where the waste arising from the communication of a circular motion to the water contained in the arm is avoided, the causes of loss just mentioned are in most respects the same. The writer believes that, in this machine, the per centage of useful effect has been found to be from 70 to 75 per cent. In estimating the useful effect likely to be realized by the centrifugal pump, we may take this as a guide; and since, in this case, 50 per cent. is the limit, instead of 100 per cent., we have $\frac{75}{100} \times 50 = 37\frac{1}{2}$ per cent. as the practical result.

Although, therefore, the waste of fuel in employing this pump is very great, it does not follow that it cannot be employed with advantage under any circumstances. There are many cases when fuel is cheap, and when it is, consequently, of greater importance to effect a saving in the first cost of a machine than in the quantity of fuel which it consumes. Local peculiarities, too, may render it not only difficult to erect a pumping engine of the ordinary construction (which requires strong and heavy foundations), but even impossible.

In answer to a question from Mr. Buckle, Mr. Stein (in the absence of Mr. Robertson, the author of the paper, who was prevented by illness from attending), explained, that the paper was only intended to investigate the theory of centrifugal action, as applied to raising water—not the practical results of machines that had been constructed: the object was to shew, that the centrifugal action is not the one to be aimed at, being a losing action, as far as raising the water is concerned. In centrifugal pumps, there is not only the radial action, from the centre to the circumference, but also that in the direction of the tangent: the former only is effective in raising the water,—the latter being all lost,

and only making the water revolve round a fixed centre, which absorbed so much of the power uselessly.

Mr. Buckle considered a balanced bucket-and-clack pump best for short lifts, and a plunger-pump, with equilibrium clacks, best for all high lifts. He asked what was the limit to the height to which water could be raised by centrifugal pumps?

Mr. Stein said, there was, theoretically, no limit to the height; it only depended on the velocity given to the circumference of the arms.

Mr. Phipps thought that quite an erroneous view of the question was taken in the paper. It supposed that the water issued from the arms with the full tangential velocity, which would involve a great loss; but that was not the case. He thought that it might be put in a different way. Imagine that an elastic band, round the periphery of the revolving arms, confined the water, and represented the resistance to be overcome: this band would yield a little outwards, in proportion to the pressure, and give vent to an annulus of water at a slow speed—not at the great tangential velocity supposed, but at the rate corresponding to the difference between the internal and external pressure. He understood Mr. Appold's experiments with his centrifugal pump at the Exhibition, gave an effect of 70 per cent. of the power expended.

Mr. Stein explained, that the paper was only upon the principles of the true centrifugal pump. There were, perhaps, some rotary pumps which might involve another principle of lifting the water by an inclined-plane action of the oblique arms, which would not involve a loss of power to the same extent; but the investigation in the paper applied only to those pumps with radial arms, where centrifugal action alone was employed.

Mr. E. A. Cowper observed, that Appold's pump had curved or oblique arms, which would have an inclined-plane action, to some extent, in lifting the water.

Mr. H. Grissell said, he had constructed two large pumps, for draining purposes, on Appold's plan, which worked exceedingly well, lifting 8,000 and 10,000 gallons of water per minute. Mr. Appold had made experiments on the power employed, and had found, he understood, a result of about 70 per cent.; but he did not know the exact means by which the power was measured.

Mr. Phipps said, he believed Mr. Appold had tried an experiment on the power consumed, by means of a Prony's friction-break, upon a centrifugal pump at his factory.

Mr. Edwards, of Birmingham, said, he had manufactured several of Gwynne's centrifugal pumps, and he had recently tried an experiment with one that contained some further improvements of his own invention, having a revolving disc 13 inches in diameter, and driven at 800 revolutions per minute. It raised 650 gallons of water per minute to a height of 17½ feet, with a five-horse power steam-engine, which he considered was equal to a duty of 70 per cent.

Mr. Crampton inquired whether the actual power had been measured that was developed by the engine, and employed in that experiment, by means of an indicator or otherwise? He believed that an effect of 70 per cent. of the power employed had been found to be obtained in Appold's pump at the Exhibition, but only about half that effect from Gwynne's pump.

Mr. Edwards replied, that the power had not been measured by an indicator in his experiment, but had been calculated from the dimensions of the engine and the pressure of steam at the time, which he thought would be nearly correct. It was a high-pressure steam engine, with a cylinder 8-inch diameter and 18-inch stroke, working 100 double strokes per minute, and the steam was at 45 lbs. per inch;—the back pressure, he thought, would not be more than about 2 lbs. per inch on the piston.

Mr. Buckle observed, that it was very deceiving to form any estimate of the power given out by a steam-engine from the pressure of the steam in the boiler; and it was impossible to ascertain the effective moving pressure in the cylinder, unless by taking indicator figures.

The following paper, by Mr. Charles Cowper, of London, was then read:—

On Bourdon's metallic barometer, indicator, and other applications of the same principle.

The invention of the instruments which are the subject of this paper, was the result of an accidental circumstance. M. Bourdon had occasion to restore the form of a worm-pipe of a still, which had been accidentally flattened. To effect this, he closed one end, and forced water in it at the other end. The flattened tube expanded to its proper form; but, at the same time, M. Bourdon observed that the tube uncoiled itself to a certain extent; and it occurred to him to apply this fact to the construction of a pressure-gauge.

If a pressure of steam or other fluid be applied to the interior of a flattened metallic tube, bent into a circular form, it will be found to uncoil itself as the pressure increases; and, on removing the pressure, it will return to its original form. If it is exposed to external pressure, or if the air is withdrawn from the interior, the tube coils itself up to a smaller diameter. It will be found that, as the tube uncoils itself, it becomes thicker, from the sides becoming more convex; and as it coils itself up, it becomes thinner. It is upon this relation between the thickness of the tube and the diameter of the coil, that the action of the instrument depends.

The simplest form of the instruments described in this paper is a steam-pressure gauge, in which rather more than one convolution of flattened tube is employed. One end of this tube is fixed to a stop-cock, in connection with the steam-boiler, and the other end carries an index, the extremity of which traverses over a scale, graduated to pounds pressure per square inch. In some

cases, a small slider, or an additional loose hand, is added, which is pushed forward by the motion of the index, and serves to register the maximum or minimum pressure. In another form of the instrument, the flattened tube is fixed at the top, and makes one turn, and the free end is connected by a link to a lever and index. These instruments serve equally well as pressure-gauges and as vacuum-gauges.

The above construction of instrument answers perfectly for fixed engines; but if its position is varied by laying it on its side, the weight of the tube causes it to spring a little, and thus to interfere with the accuracy of its indications. Therefore, in cases in which the position of the instrument is exposed to variation, as in sea-going vessels, it is preferable to employ a circular tube fixed in the centre to the stop-cock, and having its ends (which are closed) connected by links to the two ends of a lever, turning upon a centre, and carrying the index. The two branches of the tube are thus made to balance each other, and the index being also balanced, the instrument may be placed in any position without its indications being thereby affected. When a great range of motion is required, the lever is not placed on the axis of the index, but carries a toothed segment, which drives a pinion on the spindle of the index.

This arrangement is well adapted for barometers: in which case the air is exhausted from the flattened tube; and it is then soldered up. The pressure of the atmosphere acts on the exterior, and is balanced by the elasticity of the tube, which varies in curvature with every variation in the pressure of the atmosphere. In order to prevent any slackness in the different joints from affecting the accuracy of the indication, a small hair-spring may be attached to the axis of the index, which will keep a slight tension upon all the joints, and keep the teeth of the pinion always in gear with the same side of the teeth of the sector.

If the curved flattened tube be filled with alcohol or other liquid, and hermetically closed, the instrument becomes a thermometer,—shewing, by the motion of the index, every change in the volume of the enclosed liquid. The tube, being of metal, transmits the heat to the enclosed liquid with greater rapidity than is the case with a glass thermometer. In some instances, however, as in ascertaining the temperature of corrosive liquids, it might be advisable to employ a tube of glass.

A pyrometer, for measuring high temperature, is made by connecting one of the pressure-gauges, by a small platinum tube, to a hollow ball of platinum, filled with air. The platinum ball being exposed to heat, the elasticity of the air contained in it is increased, and its pressure is indicated by the pressure-gauge.

If, in place of bending the flattened tube, it is twisted, by fixing one end, and turning the other round, a sort of quick threaded screw is obtained, which has the property of untwisting itself when acted on by internal pressure, and *vice versâ*. A thermometer, made by filling one of these twisted tubes with alcohol or

other liquid, and provided with a float, is convenient for enabling brewers and others to ascertain the temperature of large quantities of liquid. The thermometer is allowed to float in the liquid, and the temperature is read off on the dial, without the necessity of lifting the instrument out of the liquid.

By applying a tube of suitable dimensions, in connection with a steam boiler, it may be made to open and shut the damper, and thus regulate the pressure in the boiler. A similar arrangement, with a thermometer, serves to regulate an Arnott's stove or a furnace.

A steam-engine indicator is made by removing the cylinder, piston, and spring of an ordinary indicator, and substituting a bent or twisted tube, which is connected at one end to the steam-cylinder of the engine, and at the other, by a short link, to a long lever, that carries a pencil at its upper end. The paper or card is fixed on a brass plate, which slides up and down on a fixed guide in front of the pencil, and is moved by a pinion working into a rack on the back of the plate. This pinion carries a pulley upon its axis, which is driven by a string from the beam or parallel motion of the engine; and the pulley can be removed, and replaced by others of different diameters. The pulley and pinion are mounted on a spindle passing through a fixed hollow pin. A spiral spring is attached to the fixed pin, and enclosed in a flat circular box, which fits in a cavity in the side of the pulley: this spring serves to keep the string always in a state of tension. The long lever which carries the pencil turns on a fixed pin at bottom, and prevents the pencil from being moved out of its course by the friction of the paper against it, which might happen if the pencil were attached at once to the tube. The ends of the figure drawn on the paper are slightly curved; and it is necessary to measure the figure with a curved scale of the same radius as the lever.

To shew that the principle may be carried out on a still larger scale, M. Bourdon has constructed a single-acting steam-engine, in which a curved flattened tube, made of two steel plates, is employed in place of the cylinder and piston. One end of the tube is fixed, and the other is united by a connecting-rod to a crank and fly-wheel. A slide valve is attached to the fixed end of the tube, and worked by an excentric on the crank-shaft. The steam is thus alternately admitted and discharged from the tube; and the engine has thus been worked at a speed of several hundred strokes per minute. To avoid unnecessary loss of steam, the tube is filled with oil; so that the steam only enters a portion of the tube, equal to the increase of its capacity produced by the pressure of the steam. When the engine is non-condensing, the crank is set a little past the centre when the engine is at rest; but when the engine is condensing, it is set near half-stroke when at rest, as the tube expands with the steam-pressure, and collapses with the vacuum.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th June, to the 17th July, 1852, inclusive.

To Richard Christopher Mansell, of Ashford, in the county of Kent, civil engineer, for improvements in railways, in railway rolling stock, and in the machinery for manufacturing the same.—Sealed 21st June.

John Harcourt Brown, of Aberdeen, Scotland, and John Macintosh, of the same place, for improvements in the manufacture of paper and articles of paper.—Sealed 21st June.

Thomas Twells, of Nottingham, manufacturer, for certain improvements in the manufacture of looped fabrics.—Sealed 30th June.

Peter Bruff, of Ipswich, in the county of Suffolk, civil engineer, for improvements in the construction of the permanent way of rail, tram, or other roads, and in the rolling stock or apparatus used therefor.—Sealed 16th July.

List of Patents

Granted for SCOTLAND, from the 22nd June to the 22nd July, 1852.

To Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, mechanical draughtsman, for improvements in separating substances of different specific gravities,—being a communication. Sealed 23rd June.

John Lintorn Arabin Simmons, of No. 67, Oxford-terrace, Hyde-park, Captain in the Royal Engineers, and Thomas Walker, of the Brunswick Iron Works, Wednesbury, Staffordshire, for improvements in the manufacture of ordnance, and in the construction and manufacture of carriages, and traversing apparatus for manœuvring the same.—Sealed 28th June.

John Henry Johnson, of 47, Lincoln's Inn's Fields, London, for improvements in steam-engines,—being a communication.—Sealed 28th June.

Frederick Sang, of 58, Pall-mall, London, Artist in Fresco, for improvements in machinery or apparatus for cutting, sawing, grinding, and polishing.—Sealed 30th June.

Peter Bruff, of Ipswich, civil engineer, for improvements in the construction of the permanent way of rail, tram, or other roads, and in the rolling stock, or apparatus used therefor.—Sealed 5th July.

George Laycock, late of Albany, in the United States of America, but now of Doncaster, tanner, for improvements in the unhairing and tanning hides.—Sealed 6th July.

Robert John Smith, of Islington, London, for certain improvements in machinery or apparatus for steering ships and other vessels.—Sealed 7th July.

James Higgin, of Manchester, manufacturing chemist, for certain improvements in bleaching and scouring woven and textile fabrics and yarns.—Sealed 8th July.

William Beckett Johnson, of Manchester, manager for Messrs. Ormerod and Son, engineers and iron-founders, for improvements in railways, and in apparatus for generating steam.—Sealed 12th July.

Richard Paris, of Long-acre, modeller, for improvements in machinery or apparatus for cutting and shaping cork.—Sealed 12th July.

Peter Armand Le Comte de Fontainemoreau, of No. 4, South-street, Finsbury, London, for improvements in the apparatus for kneading and baking bread, and other articles of food of a similar nature,—being a communication.—Sealed 13th July.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, London, mechanical draughtsman, for improvements in machinery for cutting soap into slabs, bars, or cakes,—being a communication.—Sealed 15th July.

Richard Laming, of Millwall, in the county of Middlesex, chemist, for improvements in the manufacture and in the burning of gas; in the treatment of residual products of such manufacture; and of the distillation of coal, or similar substances; and of the coking of coal; and in the application of a certain substance which may be obtained from such treatment to the manufacture of paper.—Sealed 19th July.

Emery Rider, of Bradford, manufacturer, for improvements in the manufacture or treatment of India-rubber and gutta-percha, and in the applications thereof,—being partly a communication.—Sealed 19th July.

Charles Augustus Preller, of Abchurch-lane, London, for improvements in the preparation and preservation of skins, and animal and vegetable substances,—being a communication.—Sealed 19th July.

William Reid, of University-street, electric-telegraph engineer, and Thomas Watkins Benjamin Brett, of Hanover-square, for improvements in electric telegraphs.—Sealed 19th July.

Peter Armand Le Comte de Fontainemoreau, of No. 4, South-street, Finsbury, London, for certain improvements in railways and locomotive engines; which said improvements are also applicable to every kind of transmission of motion,—being a communication.—Sealed 21st July.

Joseph Maudslay, of the firm of Maudslay, Sons and Field, of Lambeth, for improvements in steam-engines, which are also applicable, wholly or in part, to pumps and other motive machines.—Sealed 21st July.

William Septimus Losh, of Wreay Syke, in the county of Cumberland, for improvements in obtaining salts of soda.—Sealed 21st July.

Richard Archibald Brooman, of Fleet-street, London, for improvements in the purification and decoloration of oils, and in the apparatus employed therein,—being a communication.—Sealed 21st July.

Robert Hesketh, of Wimpole-street, St. Mary-le-bone, London, for improvements in apparatus for reflecting light into rooms and other parts of buildings and places.—Sealed 22nd July.

Edward Maitland Stapley, of Cheapside, London, for improvements in cutting mouldings, tongues, and other forms, and in planing wood,—being a communication.—Sealed 22nd July.

New Patents

SEALED IN ENGLAND.

1852.

To Thomas Hoblyn, of White Barns, in the county of Hertford, Esq., for certain improvements in the art of navigation. Sealed 28th June—6 months for inrolment.

Matthew Augustus Crooker, of the city of New York, United States of America, engineer, for certain improvements in paddles for steam vessels. Sealed 28th June—6 months for inrolment.

James Edward Coleman, of Porchester House, Bayswater, in the county of Middlesex, Gent., for improvements in the application of India-rubber and gutta-percha, and of compounds thereof. Sealed 28th June—6 months for inrolment.

Duncan Mackenzie, of London, Gent., for certain improvements in machinery and apparatus for reading in and transferring designs or patterns, and for cutting, punching, and numbering, or otherwise preparing perforated cards, papers, or other materials used or suitable in the manufacture of figured textile fabrics, by Jacquards or other weaving looms or frames. Sealed 29th June—6 months for inrolment.

Lazare François Vaudelin, of Upper Charlotte-street, Fitzroy-square, for improvements in obtaining wool, silk, and cotton from old fabrics, in a condition to be again used,—being partly a communication. Sealed 30th June—6 months for inrolment.

Richard Hornsby, of Spittlegate, Grantham, in the county of Lincoln, agricultural implement-maker, for improvements in machinery for thrashing, shaking, riddling, and dressing corn. Sealed 3rd July—6 months for inrolment.

Edward Clarence Shepard, of Duke-street, in the City of Westminster, Gent., for improvements in electro-magnetic apparatus, suitable for the production of motive power, of heat, and of light,—being a communication. Sealed 6th July—6 months for inrolment.

Martyn John Roberts, of Woodbank, in the county of Bucks, Gent., for improvements in the production of electric currents, in obtaining light, motion, and chemical products and effects, by the agency of electricity; part or parts of which improvements are also applicable to the manufacture of acids and to the reduction of ores. Sealed 6th July—6 months for inrolment.

William Tanner, of Exeter, leather-dresser, for improvements in dressing leather. Sealed 6th July—6 months for inrolment.

Edward Maitland Stapley, of Cheapside, for improvements in cutting mouldings, grooves, tongues, and other forms, and in planing wood,—being a communication. Sealed 6th July—6 months for inrolment.

Moses Poole, of the Patent Office, London, Gent., for improvements in reaping and mowing machines, and in pulverizing land,—being a communication. Sealed 6th July—6 months for inrolment.

Thomas Blakey and Joseph Skaife, of Keighley, in the county of York, millers, for improvements in mills for grinding. Sealed 6th July—6 months for inrolment.

James Higgins, of Salford, in the county of Lancaster, machine-maker, and Thomas Schofield Whitworth, of the same place, mechanic, for certain improvements in machinery or apparatus for spinning and doubling cotton and other fibrous substances. Sealed 6th July—6 months for inrolment.

Harold Potter, of Over Darwen, in the county of Lancaster, carpet manufacturer, and Matthew Smith, of the same place, manager, for certain improvements in looms for weaving, and in the manufacture of terry fabrics. Sealed 6th July—6 months for inrolment.

Jules Lemoine, of Courbevoie, near Paris, in the Republic of France, chemist, for an improved composition applicable to the purposes of varnish, to the waterproofing of fabrics, to the manufacture of transparent fabrics, to the fixing of colors, and to other useful purposes. Sealed 6th July—6 months for inrolment.

John Henry Johnson, of Lincoln's Inn Fields, in the county of Middlesex, and of Glasgow, North Britain, Gent., for improvements in steam-engines,—being a communication. Sealed 6th July—6 months for inrolment.

Alfred Henry Gaullie, of Paris, in the Republic of France, sculptor, for an improved plastic composition, applicable to manufacturing purposes. Sealed 6th July—6 months for inrolment.

William Septimus Losh, of Wreay Syke, in the county of Cumberland, Gent., for improvements in obtaining salts of soda. Sealed 6th July—6 months for inrolment.

James Murdoch, of Staple Inn, Holborn, for an improvement in the manufacture of certain kinds of woollen fabrics,—being a communication. Sealed 6th July—6 months for inrolment.

John Andrews, of Fair Oak-terrace, Minde, Newport, Monmouthshire, contractor, for certain improvements in coke ovens, and in the apparatus connected therewith. Sealed 6th July—6 months for inrolment.

Frederick Sang, of Pall Mall, Artist in Fresco, for certain improvements in machinery or apparatus for cutting, sawing, grinding, and polishing. Sealed 6th July—6 months for inrolment.

Friedrich Gesswein, of Cannstadt, in the Kingdom of Wurtemberg, stone-mason, for a method of preparing for baking and burning masses of clay of any given form and size, and baking and burning the same, when so prepared, as thoroughly and completely as a common brick can now be baked or burnt. Sealed 6th July—6 months for inrolment.

John Ramsden, of Manchester, screw-bolt manufacturer, for certain improvements in machinery or apparatus for cutting screws. Sealed 6th July—6 months for inrolment.

Joseph Jepson Oddy Taylor, of Gracechurch-street, in the City of London, machinist, for an extension for the term of four years from the first day of May last, for part of his invention described in the original letters patent, under the title of "an improved mode of propelling ships and other vessels on water." Sealed 6th July.

Warren Stormes Hale, of Queen-street, Cheapside, in the City of London, candle-maker, and George Roberts, of Great Peter-street, in the city of Westminster, miner, for improvements in the manufacture of night-lights or mortars. Sealed 8th July—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in machinery for cutting soap into slabs, bars, or cakes,—being a communication. Sealed 10th July—6 months for inrolment.

Thomas Jordan, of Old Broad-street, in the City of London, for improvements in disinfecting essential oils, and in treating fatty matters obtained from shale, schistus, or other bituminous substances; and in retorts employed in distilling such minerals. Sealed 12th July—6 months for inrolment.

Joseph Baron Palm, of Castle-street, Holborn, in the City of London, for an improved mode of baking bricks, tiles, and

other kinds of pottery or earthenware. Sealed 13th July—6 months for inrolment.

Charles Burrell, of Thetford, in the county of Norfolk, and Matthew Gibson, of Rollington-terrace, Newcastle-on-Tyne, for improvements in reaping machines. Sealed 15th July—6 months for inrolment.

George Hinton Bovill, of Abchurch-lane, in the City of London, for improvements in manufacturing wheat and other grain into meal and flour. Sealed 15th July—6 months for inrolment.

Moses Poole, of the Patent Office, London, Gent., for improvements in boots, shoes, clogs, and similar articles,—being a communication. Sealed 15th July—6 months for inrolment.

Henry John Gauntlett, of Charlotte-street, Portland-place, Doctor in Music, for improvements in organs, seraphines, and other similar wind instruments; and also improvements in pianofortes,—being partly a communication. Sealed 15th July—6 months for inrolment.

Charles Barrington, of the city and county of Philadelphia, in the United States of America, Gent., for an improved steam-boiler water-feeding apparatus, and furnace therefor,—being a communication.—Sealed 15th July—6 months for inrolment.

Charles James Pownall, of Addison-road, in the county of Middlesex, Gent., for improvements in the treatment and preparation of flax and other similar fibrous vegetable substances. Sealed 15th July—6 months for inrolment.

Thomas Richards, of St. Erth, and Samuel Grose, of Gwinear, both in the county of Cornwall, for certain improvements in machinery for reducing and pulverizing ores, minerals, stones, and other substances. Sealed 15th July—6 months for inrolment.

John Hunt, of Rennes, France, Gent., for certain machinery for washing and separating ores. Sealed 16th July—6 months for inrolment.

William Fawcett, of Kidderminster, in the county of Worcester, for certain improvements in the manufacture of carpets—6 months for inrolment.—This patent being opposed at the Great Seal, was not sealed till the 17th July, but bears date the 2nd February last, by order of the Lord Chancellor.

Joseph William Schlesinger, of Brixton, in the county of Surrey, Gent., for improvements in fire-arms, in cartridges, and in the manufacture of powder,—being partly a communication. Sealed 20th July—6 months for inrolment.

Julius Friedrick Philipp Ludwig Von Sparre, of Brewer-street, Golden-square, mining engineer, for improvements in separating substances of different specific gravities, and in the machinery and apparatus employed therein. Sealed 20th July—6 months for inrolment.

Stribblehill Norwood May, of Fitzroy-square, Gent., for certain improvements in the manufacture of thread yarn, and various textile fabrics, from certain fibrous matters. Sealed 20th July —6 months for inrolment.

Emery Rider, of Bradford, in the county of Wilts, manufacturer, for improvements in the manufacture or treatment of India-rubber and gutta-percha, and in the applications thereof. Sealed 20th July—6 months for inrolment.

John Shaw, of Dukinfield, in the county of Chester, cylinder-maker, for certain improvements in machinery or apparatus for carding cotton, wool, flax, and other fibrous materials. Sealed 20th July—6 months for inrolment.

Sir William Burnett, Knight Companion of the Most Honorable Order of the Bath, of Somerset House, in the county of Middlesex, for an extension for the term of seven years from the 26th day of July, 1852, being the day of the expiration of the original grant for his invention of "improvements in preserving wood and other vegetable matters from decay." Sealed 20th July.

John Francis Egan, of Covent Garden, for improvements in the manufacture of sugar,—being a communication. Sealed 20th July—6 months for inrolment.

James McHenry, of Liverpool, merchant, for certain improvements in machinery for manufacturing bricks and tiles,—being a communication. Sealed 20th July—6 months for inrolment.

Richard Bealey, of Radcliffe, in the county of Lancaster, bleacher, for certain improvements in apparatus used in bleaching. Sealed 20th July—6 months for inrolment.

George Augustus Huddart, of Brynkir, in the county of Caernarvon, Esq., for improvements in the manufacture of cigars. Sealed 20th July—6 months for inrolment.

Richard Buckton and Thomas Lawson, both of Leeds, in the county of York, manufacturers, for certain improvements in the adaptation and application of a new manufactured material to certain articles of dress. Sealed 21st July—6 months for inrolment.

John Kirkham, of the New-road, in the county of Middlesex, civil engineer, and Thomas Nesham Kirkham, of Fulham, civil engineer, for improvements in the manufacture of gas for lighting and heating. Sealed 22nd July—6 months for inrolment.

Henry Bessemer, of Baxter House, Old St. Pancras-road, for improvements in the manufacture, refining, and treating sugar,—part of which improvements are applicable for evaporating other fluids. Sealed 24th July—6 months for inrolment.

CELESTIAL PHENOMENA FOR AUGUST, 1852.

D.	H.	M.	
1			Clock before the ☉ 6m. 0s.
—			☽ rises 8h. 57m. A.
—			☽ pass mer. 0h. 56m. M.
—			☽ sets 5h. 29m. M.
	10	36	♃'s first sat. will em.
3			Occul. 33, Piscium, im. 10h. 55m. em. 11h. 36m.
5			Clock before the ☉ 5m. 40s.
—			☽ rises 10h. 10m. A.
—			☽ pass mer. 3h. 54m. M.
—			☽ sets 10h. 6m. M.
6	2	0	☽ in Apogee
	7	41	♃'s third sat. will im.
	8	2	♃ in □ with the ☉
	9	29	Vesta in □ with the ☉
	20	22	♅ in conj. with the ☽ diff. of dec. 4. 15. N.
7	9	33	☿ greatest elong. 27. 22. E.
	16	23	♄ in conj. with the ☽ diff. of dec. 1. 41. N.
8	0	37	☿ in Aphelion
	1	27	☽ in □ or last quarter
	10	3	♃'s second sat. will em.
9	15	23	♄ in in □ with the ☉
10			Occul. z Tauri, im. 13h. 5m., em. 13h. 53m.
—			Clock before the ☉ 5m. 2s.
—			☽ rises Morn.
—			☽ pass mer. 7h. 31m. M.
—			☽ sets 3h. 40m. A.
11	6	53	♀ stationary
12	15	43	♀ in conj. with the ☽
13	6	0	♅ stationary
	17	9	Vesta in conj. with ♄ diff. of dec. 5. 54. S.
15			Clock before the ☉ 4m. 11s.
—			☽ rises 4h. 9m. M.
—			☽ pass mer. 0h. 5m. A.
—			☽ sets 7h. 46m. A.
	1	58	Ecliptic conj. or ● new moon
16			Mercury, R. A., 11h. 14m. dec. 1. 23. N.
—			Venus, R. A., 7h. 25m. dec. 15. 24. N.
—			Mars, R.A., 12h. 33m. dec. 3. 15. S.
—			Vesta, R. A., 3h. 5m. dec. 8. 58. N.

D.	H.	M.	
16			Juno, R. A., 0h. 26m. dec. 3. 30. N.
—			Pallas, R. A., 9h. 34m. dec. 1. 50. N.
—			Ceres, R. A., 10h. 28m. dec. 17. 33. N.
—			Jupiter, R. A., 14h. 52m. dec. 15. 35. S.
—			Saturn, R. A., 3h. 4m. dec. 14. 50. N.
—			Uranus, R. A., 2h. 25m. dec. 15. 53. N.
—			Mercury pass mer. 1h. 34m.
—			Venus pass mer. 21h. 42m.
—			Mars pass mer. 2h. 52m.
—			Jupiter pass mer. 5h. 11m.
—			Saturn pass mer. 17h. 21m.
—			Uranus pass mer. 16h. 42m.
	16	17	☿ in conj. with the ☽ diff. of dec. 8. 48. S.
17	8	54	♃'s first sat. will em.
	22	0	☽ in Perigee
18	4	52	♂ in conj. with the ☽ diff. of dec. 5. 16. S.
19	8	38	♀ greatest hel. lat. S.
	19	23	Pallas in conj. with the ☉
20			Juno stationary
—			Clock before the ☉ 3m. 6s.
—			☽ rises 11h. 3m. M.
—			☽ pass mer. 4h. 28m. A.
—			☽ sets 9h. 40m. A.
	17	35	♃ in conj. with the ☽ diff. of dec. 3. 18. S.
	18	2	☿ stationary
22	6	2	☽ in □ or first quarter
25			Occul. χ^2 Sagittarii, im. 6h. 21m. em. 7h. 34m.
	21	25	♀ at greatest brilliancy
—			Clock before the ☉ 1m. 49s.
—			☽ rises 5h. 9m. A.
—			☽ pass mer. 9h. 3m. A.
—			☽ sets 0h. 2m. M.
26			Occul. B.A.C. 7049, im. 10h. 40m. em. 11h. 29m.
28	10	52	☿ greatest hel. lat. S.
30	9	9	♄ stationary

J. LEWTHWAITE, Rotherhithe.

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No. CCXLIX.

RECENT PATENTS.

To THOMAS RESTELL, *of the Strand, in the City of Westminster, watchmaker, for improvements in locks or fastenings.*—[Sealed 8th December, 1851.]

THE object of one part of these improvements in locks is to construct the key-hole in such a manner that not more than one instrument can be introduced into the lock at one time, for the purpose of picking the same; and further, that if any instrument, other than the proper key, be introduced, and turned partly round, it will meet with an obstruction, as usual in all combination locks, but cannot be withdrawn therefrom until all the internal parts have been brought back into their natural position. The patentee effects this object by surrounding the spindle of the key-hole with a cylindrical curtain or guard, combined with a circular plate or shield;—these parts being constructed in such a manner that, when the key or other instrument is introduced and turned round in the key-hole, the circular plate or shield is carried round inside the lock, and, covering up the hole, thereby prevents the introduction of a second instrument. This part of the improvements is shewn in Plate VI., at figs. 1, 2, and 3, where fig. 1, is an elevation of the inside of a drawer or box-lock; and figs. 2, and 3, shew the cylindrical curtain and shield detached, both in front view and section. The cylindrical curtain *a*, surrounds the spindle in the key-hole, and carries the circular plate or shield *b*, which is moved round by the key, with the curtain *a*. The cylindrical curtain passes through the top plate of the lock, and, being flush with the upper surface

thereof, is held in its proper position thereby, without further assistance. The bolt *c*, is furnished, as usual, with a pin, stud, or bit *d*, which moves in the slots or gates of the tumblers or sliders *e*, the notches whereof are made wider than usual, for reasons hereafter explained. In order to prevent the key from being turned in the wrong direction, a projecting stud or tooth *f*, is formed on, or attached to, the periphery of the circular plate or shield *b*; and when the plate *b*, and curtain *a*, are moved round either way, this tooth or stud will be brought against one side or the other of the bit *d*, and the key will be thereby prevented from going round any further. The tooth *f*, serves also to hold the curtain *a*, and circular shield *b*, in their proper position to receive the key; as, unless some precaution of this kind were taken, the circular shield might accidently slip round and close the key-hole. Shields or plates to prevent the introduction of instruments into the key-hole have heretofore been used; and, in order to prevent them from slipping round and accidentally closing the key-hole, it has been the custom to pinch or bear upon the shield by the upper plate of the lock, so as to cause such an amount of friction as will prevent the shield from moving, except when acted upon by the key. One of the methods adopted by the patentee for preventing the circular plate from slipping round accidentally consists in causing the tooth *f*, to take into a notch *g*, in a block that is attached to the upper part of the uppermost tumbler *e*. By this arrangement, he is enabled to relieve the shield from the friction to which it has hitherto been subjected. Sometimes he surrounds the cylindrical guard with a small spiral spring, as represented at figs. 4, and 5,—the latter figure shewing the curtain and shield, just described, adapted to a drawer-lock, with a different mode of holding them in their place. The principal difference between this modification and that just described is, that instead of the curtain *a*, and circular shield *b*, being held in their place by means of the tooth *f*, the same object is effected by an indentation *h*, in which rests a projecting point on the front edge of the upper tumbler *e*. The key is prevented from being turned in the wrong direction by the tooth *f*, on the circular shield, as in the former instance; but, instead of abutting against the bit or stud on the bolt, there is a moveable stop-piece *i*, which is secured to the plate of the lock by means of two screws, but may be moved up or down by the tooth *f*, whenever the bolt of the lock is moved up or down by the key.

Fig. 6, is another modification, in which the curtain *a*, and

circular shield *b*, are also held by a point on the edge of the top tumbler taking into a notch on the edge of the circular shield; and the shield, in this instance, is furnished with two teeth *f*, *f**, which, by abutting against one or other of the studs or pins *d*, *d**, on the bolt, prevent the key from being turned in the wrong direction.

Fig. 7, represents another mode of holding the circular shield or plate, by means of a spring *j*, affixed to the inside of the upper plate of the lock (which is removed, so as to shew the position of the spring), and bearing against the edge of the shield *b*, as it is moved round; so that when the latter is brought into the proper position for removing the key, either when the lock is open or closed, the lower end of the spring *j*, will enter into the notch on the periphery of the shield, and hold it in its proper position.

Figs. 7, 8, and 9, serve to illustrate a simple means of so altering the combination of the tumblers with the bolt, that the original key, when the alteration is made, will not open the lock. This object is obtained without altering the position or combination of the tumblers, in relation to one another, by simply making the bit or stud *d*, of the bolt moveable. Fig. 8, exhibits the lock with the shield and tumblers removed, in order that the construction of the bolt may be more clearly seen. The bit or stud *d*, which traverses in the notches of the tumblers, is usually a fixture on the bolt; but, in the present instance, it is secured to a small moveable plate *k*, seen in the back view, fig. 9. Two holes are made in the bolt *c*, in either of which the bit *d*, may be inserted, and made to project through the tumblers. A recess is made in the back plate of the lock to receive the plate *k*; and when the bit *d*, is inserted in its place in one of the holes of the bolt, the plate *k*, is secured by means of a sliding plate or shutter *l*. When it is required to spoil the combination, and render the original key useless, it will only be necessary to open the shutter *l*, and remove the bit from one hole to the other in the bolt: the effect of this alteration will be that, in order to allow the bit to pass freely through the gates of the tumblers, and thereby permit the bolt to be shot, the tumblers must be raised to a different height to that which was before required; and, consequently, a different key must be employed to produce this effect. In constructing locks with this improvement adapted thereto, the patentee proposes to make three keys, two for the first combination and one for the second; so that if one key belonging to the first combination should be lost, the lock may be opened with the fellow key,

and then the combination spoiled by raising the shutter *l*, and moving the plate *k*, and bit *d*, from one hole to the other: which being done, it will be found that the third key only will open and close the lock; and therefore the other two keys will be useless. In order to prevent the bolt from moving while the position of the bit is being changed, a small pin 1, may be attached to the lower part of the bolt, and made to enter a notch in the lowest tumbler, or that nearest the bolt, so as to prevent the bolt from shifting its position.

The same effect, that is, spoiling the combination, may be produced by mounting the pin *m*, fig. 7, on which the tumblers turn, on a moveable plate: the bit *d*, will, in this case, of course be fixed to the bolt as usual. The pin *m*, being attached to a moveable plate, such as that shewn at *k*, will be caused to project through a slot or hole in the back plate of the lock, precisely as in the former instance; and it will therefore be evident, that to alter the combination, by changing the position of the tumbler, it will only be necessary to shift the position of the moveable plate which carries the pin *m*.

Fig. 10, is a vertical section of a lock, and fig. 11, is a partial plan view thereof,—serving to explain a method of altering the combination in a Bramah lock by means of a moveable plate. The security of a Bramah lock depends upon a number of vertical sliders, having notches cut on their faces; which sliders must all be pressed down to a certain point, so as to bring all their notches into the same plane, and coincident with the edge of a fixed horizontal plate; and, until this is done, the horizontal plate will prevent the barrel, containing the vertical sliders, from rotating, and consequently the bolt cannot be shot. In applying the improvements to locks of this description, the patentee secures the horizontal plate *n*, (seen detached at figs. 12,) to a moveable bridge-piece or bracket *o*. The barrel *p*, in which the vertical sliders work, is constructed in the ordinary way, except that the annular groove, which receives the horizontal circular plate *n*, is made wider than usual, to admit of the plate being moved up or down when it is required to shift its position. At the centre of the bridge-piece or bracket *o*, is formed a female screw to receive the male screw *s*; and the bracket may be raised or lowered, when required, by simply turning the screw, which is made with a shoulder, whereby it is held in its bearings in the back plate, but yet can be turned therein by applying a turn-screw or screw-driver. The vertical sliders are supported by a coiled spring, as in the ordinary construction of Bramah's lock; but the bolt *c*, is

furnished with a toothed rack (as shewn in the plan view fig. 11); and it is shot by means of a pinion *q*, at the lower end of the spindle *r*, which is supported by the end of the screw *s*. Now, supposing all the parts to be in the position shewn at fig. 10, a key, such as that represented at fig. 13, would open it; but if this key were lost, it would be necessary to so alter the internal arrangement or combination that such key would not open the lock. This can be effected by simply turning round the screw *s*, and thereby raising the moveable bridge-piece or bracket *o*, and the horizontal plate *n*, into the position indicated by the dotted lines in fig. 10. It will then be evident that the first key, if applied, would push down the sliders, so as to carry the notches therein beyond the edge of the horizontal plate *n*; and, consequently, the barrel would be prevented, by the horizontal plate, from turning round and shooting the bolt. The third key, or that shewn in fig. 14, must therefore be used; and the other keys will then be useless.

In reference to tumbler-locks, the patentee states, that, besides preventing a person from introducing more than one instrument at a time, he further proposes to prevent any person from feeling the position of the tumblers by pressing the bolt against them, as has usually been the case. Hitherto the bolt has been held in its place by the tumblers, as the bit of the bolt was made to nearly fit the notches in the tumbler; and therefore, by forcing the bolt back, and causing the bit to press against the face of the notches in the tumblers, the latter might be held in any given position, and the obstruction they would offer to opening the lock might then be felt and possibly removed. The patentee, however, constructs the lock in such a manner that the bit cannot be brought to bear against the tumblers, so as to retain them in any given position. As it is not necessary that the bit should fit the notches of the tumblers, the notches are cut much larger than usual, so as to leave a considerable space between the bit and the face of the notch; and, in order to prevent the bolt from shifting its position, except when acted on by the key, the lower edge of the bolt is provided with a tooth or pin, which bears against the periphery of the cylindrical guard, and thereby prevents the bolt from being moved either way, until the guard is turned by the key, and a notch therein is brought round, so as to permit the tooth to pass. This improvement will be best understood by referring to fig. 8, where *u*, is the tooth at the bottom of the bolt; and it will be seen, that the bolt cannot be moved, so as to bring

the bit against the tumblers, until a notch 2, in the cylindrical guard *a*, is, by means of the key, brought round to admit the tooth *u*.

Fig. 15, is a modification of the above. At the lower end of the cylindrical guard *a*, is fixed a circular plate *w*, (see also the detached view, fig. 16,) which is made to fit into curved recesses cut in the lower edge of the bolt *c*; and the bolt is thereby prevented from moving until the notch 2, comes round and allows the points *u*, *u*, which are equivalent to the tooth *u*, in fig. 8, to enter the notch. The key enters the notch in the bolt, and, provided the tumblers (not shewn in the drawing) are brought into the proper position, the bolt can then be shot.

Fig. 17, exhibits another mode of effecting a similar object. In this case, an additional notch is formed in the face of the tumblers, and one tumbler (say the lowermost one) is made a little longer than the others. A small pin *x*, is fixed in the side of the bolt; and when the proper key is used to open the lock, the tumblers will be raised in such a manner as to admit this pin through the front gate of the tumblers; but if a false key or other instrument is introduced, and the bolt pressed back thereby, the pin *x*, will be brought against the end of the lowermost or longest tumbler and retain the same. Upon discovering the obstruction, and finding all the other tumblers free, any person attempting to pick the lock will necessarily be obliged to move the obstruction out of the way by raising that tumbler; and immediately this is done, the pressure being still on the bolt, the pin *x*, will pass into the notches 3, of the other tumblers, and thereby prevent them from being raised, until all are set free again.

Fig. 18, represents a common door-lock, with three tumblers, in which the bolt can never be shot until the guard-plate or shield *b*, is moved. *e**, is a protector tumbler, which securely holds the bolt, and is kept elevated by a pin or stud *v*, in the guard-plate or shield. Before the bolt can be moved, the tumbler *e**, must be allowed to descend; and this cannot take place until the pin *v*, is brought round by the rotation of the shield-plate *b*, which thereby closes the key-hole.

Fig. 19, is a transverse section of fig. 15, and represents an arrangement for a mortice-lock, in which the key may be inserted from either side. Fig. 16, represents the double circular shield, whereby the key-holes, on both sides, may be simultaneously closed. The arrangement and operation of the tumblers, and the construction of other parts of the lock, may be according to any of the plans already described. In

order to facilitate the delivery of the key from the key-hole, the patentee introduces between the two circular plates or shields *w*, *b*, a coiled spring *y*, (fig. 19,) which is compressed by the key when the latter is introduced into the lock; and therefore, when the key (after having performed its duty in opening or closing the lock) is brought opposite the key-hole again, the force of the coiled spring will force it out.

Fig. 20, represents a side view of a latch, with some of the improvements already described adapted thereto. *c*, is the spring latch-bolt; *a*, the cylindrical guard; and *b*, the circular shield, to which is adapted a stop-pin or stud *f*, that abuts against a fixed pin *g*. The shield may be held in its proper position by any of the means already described.

The patentee claims, First,—the combination of the cylindrical curtain or guard *a*, with the circular shield *b*, and mode of applying the same, as herein shewn and described,—particularly the employment of a pin, tooth, notch, spring, or other analogous contrivance, adapted to the circular shield *b*, together with the other necessary parts connected therewith, whereby the curtain or guard and circular shield may be held in their proper positions, and prevented from slipping round accidentally when the key is withdrawn from the lock. Secondly,—the employment of pins, studs, or projecting points, adapted either to the circular shield or other part of the lock, whereby the key may be prevented from being turned in the wrong direction. Thirdly,—the use of the moveable plate *k*, and bit or pin *d*, or any mere modification thereof, whereby the position of the bit *d*, in relation to the notches in the tumblers *e*, or the position of the tumblers *e*, in relation to the bit *d*, may be altered when required, and the combination of the several parts of the lock may be so changed as to render the original key useless for opening the lock. Fourthly,—constructing the bolt with a tooth, pin, or projecting point at its lower edge (as shewn in figs. 8, and 15,), which, by bearing against the sides of the cylindrical shield, circular plate, or other suitable part, will prevent the bolt from being shot until a suitable notch, cavity, or opening—made for the purpose in the said cylindrical shield, circular plate, or other part—is brought round, so that the tooth, pin, or projecting point on the bolt may enter therein, and allow the bolt to be moved. Fifthly,—the use of the moveable plate *n*, and its moveable bridge-piece or bracket *o*, as applied to a Bramah lock, for the purpose of changing the relative position of certain parts of the lock, as shewn in figs. 10, 11, and 12;—also the method shewn in the said figures of actuating the

bolt of the lock. Sixthly,—constructing the tumblers, as shewn in fig. 17, with an additional notch at the end, into which a pin, secured to the bolt, will enter, upon applying force or pressure thereto; and, by thus holding all the tumblers, will prevent any of them from being raised, until the bolt is thrown back again. Seventhly,—the use of a protector tumbler, as shewn in fig. 18; which tumbler is, by means of a pin, connected to the circular shield, kept raised too high to allow the bolt to be shot, and cannot be allowed to descend until the circular plate is moved round and the key-hole closed. Eighthly,—the method shewn, in fig. 19, of constructing a mortice tumbler-lock, which can be opened by the key from either side,—the key-hole being protected with double shields. Ninthly,—the method, shewn and described in fig. 20, of constructing tumbler-latches.—[*Inrolled June,* 1852.]

To WILLIAM GRAYSON, *of Henley-on-Thames, in the county of Oxford, watch and clock maker, for an odometer or road-measurer, to be attached to carriages, for shewing distances over which the wheels pass.*—[Sealed 1st December, 1851.]

THIS invention consists of an arrangement of apparatus denominated an "odometer or road-measurer," to be attached to a street cab, or other vehicle, for the purpose of denoting the length of way passed over by the running-wheels.

The apparatus is composed of a train of wheelwork, with two dials and indexes, to indicate the distance travelled. It is mounted on a metal plate, and enclosed in a box, which is affixed to some convenient part of the carriage, in such a manner that one dial may be seen from the outside thereof; so that, previous to entering the carriage, the passenger may examine the dial, and have the index placed at zero. The other dial must be inspected from the inside of the carriage, and is intended for the use of the proprietor, to serve as a check upon the driver, who will be accountable for the distance travelled, as indicated or marked upon this dial, after due allowance for back carriage. The train of wheels whereby the indexes are actuated is set in motion by a pin, stud, or cam, on the nave of one of the running-wheels;—this pin, stud, or cam, is, at every revolution of the wheel, brought against the lower end of a pendent lever, which it forces back; and the upper end of the lever is thereby made to act upon a ratchet-wheel, which forms part of the mechanism of the odometer.

In Plate V., figs. 1, and 2, exhibit the improved odometer or road-measuring apparatus which forms the subject of this invention. This instrument is applied to the upper part of the body of a street cab or other vehicle, in a suitable position above the axle-tree; and from it depends a lever *a*, the lower end of which is acted upon by a pin, stud, or cam, on the nave of the running-wheel. As the wheel rotates, the pin will be brought against and caused to force back the lever, by which means, a tooth at the upper end of the lever will drive round the ratchet-wheel *c*, one tooth; as will be understood on examining fig. 1, which represents a back view of the instrument. In this view is shewn the wheelwork at the back of the plate *d*, on which all the counting mechanism is mounted. The dial *e*, represented in this figure, is inspected from the inside of the carriage, and, being enclosed within a box, cannot be tampered with by the driver. Fig. 2, represents a front view of the plate *d*,—the passenger's dial *f*, being removed, and its position only indicated by the dotted circle *f**, in order that the parts beneath may be more clearly seen. Fig. 3, exhibits the passenger's dial *f*, detached. The lever *a*, turns on a pin or centre mounted in the bridge-piece *g*, on the back of the plate *d*, as shewn in fig. 1. Its upper end bears against a stop *h*, and is kept in its proper position by a spring *i*. The ratchet-wheel is prevented by the spring-click *j*, from moving more than one tooth at a time. On the axle of the ratchet-wheel, at the opposite side of the plate *d*, is a pinion *k*, with 10 teeth, which gears into a cog-wheel *l*, with 100 teeth. On the axle of this wheel *l*, is another pinion *m*, of 10 teeth, which gears into a wheel *n*, of 100 teeth; and, on the shaft of this wheel *n*, is mounted a hollow shaft, that carries the index of the passenger-dial *f*, which, as will be seen by referring to fig. 3, indicates quarters of miles, half miles, and miles, to the number of ten. For the purpose of indicating a larger number of miles, the patentee has adapted to the back of the dial *f*, a magic or jumping index, consisting of a small dial with tens printed thereon, which is connected to a jump-wheel *o*, (fig. 2,) behind the dial *f*, shewn by dots in fig. 3. On the hollow shaft which carries the index, is mounted a pin or stud *p*, which, at every rotation of the wheel *n*, acts on the wheel *o*, and jumps it one tooth,—thereby indicating that ten miles have been travelled. The index being connected to a hollow shaft (which is mounted on the shaft of the wheel *n*, and is carried round thereby by friction of contact) may be moved round by the finger, when required to bring it back to zero, without deranging the other mecha-

nism; and, before a passenger enters the vehicle, he should see that the driver sets the index at zero; so that, at the end of his journey, he may, by a simple inspection of the dial, at once ascertain the distance he has travelled.

In order that the proprietor may be protected from fraud, his index, which is inside the carriage, will continue to count and indicate the total distance travelled during the several journeys throughout the day. The proprietor's index, as well as the passenger's index, is worked by means of the toothed wheel *n*; but an intermediate wheel *q*, of an equal number of teeth, communicates motion from the wheel *n*, to the index, which indicates, on the dial *e*, the total distance travelled. This dial *e*, is also provided with a magic or jumping index, to indicate the tens; but, as the jumping index is precisely similar in construction and operation to that connected with the passenger's index, and already described, it will not be necessary to enter further into detail in reference thereto. As the proprietor's dial and index are kept under lock and key, and none of the working parts are accessible but the pendent lever *a*, no means are left for the driver to tamper with the indicator without immediate discovery.

The apparatus and train of wheelwork, above shewn and described, are intended for a vehicle of which the running-wheels measure 12 feet in circumference; and, for this purpose, the ratchet-wheel is made with 44 teeth, which number is obtained by dividing 528 (the number of feet in the tenth part of a mile) by 12, the circumference of the running-wheel, which must, in passing over a tenth of a mile, revolve 44 times. It will therefore be evident that, if a running-wheel of any other dimensions is employed, the number of teeth in the ratchet-wheel must be varied: for instance, supposing the running-wheel measures only 11 feet, then, by dividing 528 by 11, we have 48, which gives the number of teeth for the ratchet-wheel,—all the other parts remaining the same.

The patentee does not claim the exclusive right of moving the indexes by means of wheelwork actuated by apparatus connected with the running-wheel; nor does he confine himself to the precise arrangement or construction of the parts above shewn and described for effecting this object. What he claims is, First,—the means above described for actuating the counting apparatus; and also the arrangement of wheelwork constituting the counting apparatus, in which, by simply changing the ratchet-wheel, he is enabled to adapt the apparatus, as shewn and described, to running-wheels of any circumference, without further alteration of the other wheelwork.

He further claims the employment or adaptation of two dials and indexes to the indicating apparatus,—both indexes being worked by the same train of wheelwork; and one dial and index being employed to serve for the passengers and driver, and the other for the proprietor.—[*Inrolled June,* 1852.]

To CHRISTOPHER RANDS, *of Shad Thames, miller, for improvements in grinding wheat and other grain.*—[Sealed 19th December, 1851.]

THIS invention consists in improvements in constructing, suspending, and ventilating mill-stones.

The application of this invention is exhibited by figs. 1, and 2, in Plate V., where fig. 1, is a vertical section of a pair of mill-stones, and fig. 2, is a plan view of the lower stone. The stones are formed with large openings, whereby that part of each stone which has the slowest surface speed is removed, and the enlargement of the opening admits of a fan or blower being worked within the opening, independently of the mill-stones. The upper stone *a,* is mounted on two axles *c,* in a frame *d,* which surrounds the stone *a,* and is suspended from two axles placed at right angles to the axles *c*: this arrangement, which resembles the ordinary mode of hanging a mariner's compass, enables the stone to adjust its position to that of the lower stone *b.* The lower stone (which is the one that the patentee prefers to drive) is hung or suspended in a similar manner, but internally instead of externally,—thus, the frame or plate *e,* on which the stone is affixed, receives the axles *f,* of the frame *g*; and the frame *g,* receives the axles *h,* of the boss *i,* to which the shaft *j,* is affixed: by this means rotary motion is given to the stone; while, at the same time, it is capable of swinging or moving in all directions, so that its surface may always coincide with or work parallel to the surface of the upper stone. *k,* is a fan or blower, mounted on the axle *l,* which is driven by a band from the axle *m*; and motion is communicated to the axle *m,* by a band from a pulley on the shaft *j.* The stones are enclosed within a case or hoop *n.*

The corn is fed from the hopper *o,* and falls through the shoot *p*; and it is projected with the air, by the fan or blower, towards the opening between the mill-stones. *q,* is a plate, fixed in the opening in the lower stone, and above which the fan or blower works. *r,* is an inclined plate, fixed within the

opening in the upper mill-stone, to guide the air to the opening between the stones, as it is thrown off from the vanes of the fan or blower. The fan is made with six blades; but this number, as well as the form of the same, may be varied, so long as there is an opening in the stone large enough to receive a fan or blower, and to permit it to act freely. The patentee states, that by this mode of constructing, suspending, and ventilating mill-stones, the power required will be lessened, and the grinding surface will be reduced. He prefers to crush the grain before passing it between the mill-stones.—[*Inrolled June*, 1852.]

To THOMAS BARNETT, *of the town of Kingston-upon-Hull, grocer, for improvements in machinery for grinding wheat and other grain.*—[Sealed 8th January, 1852.]

THIS invention relates to the construction of mill-stones, and to the grinding of all kinds of grain. The objects which the patentee has in view are, first, to prevent the meal or flour from becoming unduly heated, or otherwise injured during the operation of grinding; secondly, to prevent, as far as practicable, the overgrinding or re-grinding of any portion of the meal or flour; and thirdly, to obtain the greatest possible economy of power in grinding a given quantity of grain. These objects are effected by continually separating the perfectly ground flour from those parts of the grain which are only partially ground, and discharging the perfectly ground flour during the operation of grinding, before it has reached the outside or periphery of the mill-stones.

In Plate V., fig. 1, exhibits a vertical section of a pair of mill-stones, constructed and arranged according to this invention; and fig. 2, is a plan view of the lower stone. Each of the mill-stones is formed with an annular opening or series of openings *c*, dividing it into two parts *a*, and a^1, or *b*, and b^1,—the part *a*, or *b*, being termed the first grinding surface, and the part a^1, or b^1, the second grinding surface. The mill-stones represented are made of pieces of French buhr-stone, the central or inner portions whereof are enclosed in the sector-shaped compartments of an iron frame *d*, and the outer portions fit around the periphery of the frame *d*, and are held in their places by an iron hoop *e*. In this instance, the openings *c*, are formed by the frame *d*; but in grey or whole stones, a corresponding series of openings is cut through each stone. In each opening *c*, of the lower stone, is placed a frame *f*, covered with a piece of wire-gauze *g*, or

any other fabric or material that will serve as a sieve; and this piece of wire-gauze is to stand at or slightly below the level of the grinding surface of the lower stone. In the openings *c*, of the upper stone are placed brushes *h*, which, as this stone moves round, travel over the wire-gauze or sieves of the lower stone; and over such openings caps or hoods *i*, are fixed, to collect the air and conduct it downwards through the wire-gauze. Beneath the openings of the lower stone there is an inclined annular channel or passage *j*, that receives the flour from the sieves, and delivers the same through an opening at its lower part; and this passage *j*, is surrounded by another passage *k*, that receives the flour from the outer edge of the mill-stones, and discharges it through two shoots at the bottom.

The grain is fed into the eye of the upper stone as usual, and is first subjected to the action of the grinding surfaces *a*, *b*, whereby a portion is reduced to the state of flour; when the flour and partially ground grain passes from the edge of the grinding surfaces *a*, *b*, on to the wire-gauze, the action of the brushes (assisted by the draft produced by the caps *i*,) causes the flour to descend through the wire-gauze into the passage *j*; and the partially ground grain passes between the grinding surfaces a^1, b^1, by which the grinding is completed, and the flour falls from the periphery of the stones into the passage *k*.

The patentee claims, First,—the application of wire-gauze, or of any other suitable kind of sieve, to any orifice or opening in the lower stone, for the purpose of separating the perfectly ground flour from that which is unground, or only partially ground, and discharging the perfectly ground flour from the stones during the process of grinding, and before it has reached their outside or periphery. Secondly,—the application of brushes, for the purpose of facilitating the said separation and discharge of the perfectly ground flour, and of distributing the meal over the surface of the wire or other sieves fixed in the lower stone, and brushing the meal towards the outer grinding surface.—[*Inrolled July*, 1852.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in apparatus for milking animals, —being a communication.*—[Sealed 10th February, 1851.]

The improvements in apparatus for milking animals, which constitute this invention, consist in making a sack or pocket

of gutta-percha, or India-rubber, or other suitable material, for the purpose of encasing the teat of the cow or other animal; and securing, in the lower end of this sack, a small silver tube, through the orifice of which is inserted a piston or exhauster, made of silver or other suitable metal that will not readily oxidize, or it may be made of gutta-percha. This piston, when made of metal, is packed; but when made of gutta-percha it is not necessary to be packed: the silver pistons are, however, preferable for use. The tube and piston, when the sack is applied to the teat, are passed into the milk-duct of the cow's teat, and the sack drawn up around the neck of the teat. When in this situation, an elastic band, which is attached to and surrounds the neck or mouth of the bag, contracts around the teat somewhat like the pressure from the hand of a milker, and, in consequence of the impervious nature of the sack, a warmth like that of the mouth of the calf is imparted to the teat. On withdrawing the piston, the orifice of the teat is kept distended by the sides of the tube, and an instant discharge of milk follows.

In Plate VI., fig. 1, exhibits one of the improved milkers; fig. 2, is a detached view of the tube; and fig. 3, is a detached view of the piston that is inserted in the tube. The sack A, is made of gutta-percha, or India-rubber, or other suitable water and air-proof material, and of sufficient size for encasing the teat of a cow; and an elastic strap or band B, is attached to the neck or mouth of the sack, for the purpose of compressing the teat to cause the cow to give or yield down her milk, and also for retaining or holding the sack firmly on the teat. In the lower end of the sack is a tube C, made of silver or other suitable substance not liable to oxidize, and secured or attached to the sack by means of two small collars D, and E, on the tube. These collars are soldered to the tube, and are made of a dish-form, having their convex sides approximating, so as to admit of the puncture in the lower end of the sack being stretched over one of the collars or dishes, and permitted to contract again in the groove between the dishes or collars,—thereby forming a secure air-tight attachment of the sack to the piston-tube. Through the orifice of the tube is inserted a piston or exhauster G, which is about two inches long, and made of silver or other suitable metal not liable to oxidize, or of gutta-percha, or of wood; and it is made a little longer than the tube (say about one quarter of an inch), and has its end nicely rounded, to prevent it from injuring the teat when being inserted into the milk-duct or canal. On the end of the piston is a ring H, for the con-

venience of holding it while applying the set of milkers, and while waiting for the cow to give down her milk.

The operation of the milk-exhauster is as follows:—When the instrument is to be used, the person using it opens and turns the mouth of the sack down, and quite inside out, so as to expose the entering part of the tube and piston entirely. The tube (with the piston slightly projecting from its end) is now gently inserted into the orifice of the teat, as far as it will go; and in this position it is held till the sack is drawn up over it, when the elastic band or strap around the mouth of the sack contracts and firmly holds it in that state. When thus properly secured, the piston is gently withdrawn, leaving the orifice of the teat distended by the sides of the tube for the flowing of the milk, in consequence of the pressure and warmth imparted to it (somewhat like that caused by the mouth of the calf) by the air-tight sack by which it is encased.

The patentee states, that what he claims is the sack A, made of India-rubber or other suitable water or air-proof material, in combination with the elastic strap or band B, (for compressing the teat and neck of the sack) and exhauster-tube C, and piston G, or either one or more of the foregoing parts, in combination with a sack, for the purpose of milking cows, in the manner above set forth.—[*Inrolled August*, 1851.]

To THOMAS RICHARDS HARDING, *of Lille, in the Republic of France, manufacturer, for improvements in machinery for heckling and carding flax; in machinery for combing and drawing wool and other fibrous materials; and in machinery for making parts of such machines; and for a new arrangement of the steam-engine for driving flax and woollen mills,—which arrangement is also applicable to other purposes where motive power is required.*—[Sealed 17th October, 1850.]

THE first head of this invention consists in an arrangement of self-acting machinery, whereby the patentee is enabled to present both sides of the strick of flax to the action of the heckles, and successively to pass the flax under the operation of heckles of different degrees of fineness; and also to rid the heckles of the tow, and lap it upon a drum, from which it may be readily removed by hand.

In Plate VI., fig. 1, is a plan view of the improved machine; fig. 2, is a longitudinal section on the line 1, 2, of fig. 1; and fig. 3, is a view of the right-hand end of the machine.

A, A, is the framing of the machine. B, B^1, are two heckle cylinders, of equal dimensions, constructed as follows:—*a, a,* are two cog-wheels, mounted at either end of a hollow shaft *b*; on the inner face of these wheels an annular flange is cast; and to these flanges the ends of the heckle-bars are respectively bolted. The wheels of the cylinder B, gear respectively into the wheels of the cylinder B^1; and the cylinders are thereby made to revolve in opposite directions. Immediately above these cylinders, a series of flax-holder guides or carriers C, C, C, is provided, for bringing the flax under the operation of the heckles. These carriers swing from rods that extend the whole width of the machine, and are themselves supported, at either end, by a pair of endless chains *c, c,* which slide on guides *c**, and pass over the chain-wheels *d, d**, on the shafts *e, e,* and are actuated thereby. The holders of the stricks of flax *f, f,* may be of any approved construction. They are fed into the travelling-guides by hand, and are supported therein by suitable projections on the sides of the holders. The guides are of sufficient width to contain four holders,—the machine being what is termed a four-tool machine (that is, having heckles of four different degrees of fineness); but longer or shorter guides or carriers may be used; and in that case a proportionate alteration in the arrangement of the sets of heckles should be made. The stricks of flax are severally traversed over the heckle cylinders four times; at each traverse they are made to recede from the side of the machine at which they entered, and are thereby brought into contact with a finer gauge of heckle pins; and, after passing over the fourth or finest set of heckles, they are discharged from the machine. This is effected in the following manner:—Supposing the holders to be fed into the guides when they have come round to the position of the guide C*, fig. 1, the continuous revolution of the endless chains will carry forward the holder last fed into that guide, and subject the strick of flax which it contains to the action of the heckles. When the strick has passed over the cylinders B, and B^1, its holder will be carried upwards, and, in passing again to the other end of the machine, the holder will come in contact with a fixed inclined plate D, whereby it will be pushed along its guide or carrier, as indicated by the dotted lines in fig. 1, and, simultaneously, the fourth holder in that guide will be discharged from the machine. It has been stated that the guides for the holders swing from rods attached to the endless chains *c*; but at certain parts of their traverse,—viz., when they are carrying the flax holders over the inclined plate D,—they should be made

to maintain their vertical position, in order that the resistance presented by the plate D, to the direct forward motion of the holder that is brought in contact therewith, may be rendered effectual. For this purpose the guides are provided with a flat piece at their head, which slides under a fixed horizontal plate D*, (see fig. 2); and this will prevent the oscillation of the guides as they pass over the inclined plate D.

When the holders are passing over the heckle-cylinders, it is advisable that they should be made to "dwell" a short time, in order that the heckles may have time to heckle the strick close up to the holders. This is effected, without stopping the traverse of the endless chains, by fixing a projecting pin at either end of the guides, and in such a position that, during the forward movement of the guides, the pins shall meet with vertical studs, affixed to the framing, and be compelled to rock the guides on their centres before they can pass over the projecting studs. The effect of this rocking of the guides will be readily understood by referring to the diagram, fig. 4, where the line 1, 2, indicates the vertical position of the guide and its holder, and the line 1, 3, the incline which it takes by reason of the continued traverse of the chains, and the retarding action of the pins and fixed studs before mentioned. Motion is communicated to the various parts of the machine by suitable gearing from the driving-shaft E.

In order to discharge the tow from the heckles, a fan is provided at the centre of each heckle-cylinder, for creating a blast of air, which will drive off the tow, and allow of its being taken up and formed into a bat or sheet, by the means to be presently described. *g*, fig. 2, is a shaft, running through the hollow shaft *b*, of each heckle-cylinder, and turning in suitable bearings formed for its reception. This shaft *g*, carries, at about the middle of its length, a fan *h*, which is enclosed in a cylindrical case *i*, having openings at its sides for the admission of air, and a longitudinal vent, extending nearly the whole length of the cylinder, for directing a blast of air to the back of the heckle-bars: by which means the tow is forced off the pins of the heckle-bars. Air is admitted to the case *i*, through an opening 1, in a cylindrical case 2, which surrounds the blast apparatus. The object of causing the air to enter at the opening 1, is, that the draft, created by the rotation of the fan, shall force the stricks of flax into close contact with the heckles. Near the periphery of the cylinder B, there is a rotating lattice cylinder *k*, the bars whereof are provided with pins, which receive the tow as it is blown off from the heckle-pins. The tow is taken off

this cylinder by a stripper *s*, which revolves by friction of contact with the sliver drum *m*, and delivers the tow thereon in the form of a sheet, which may be taken off by hand when required. It will be understood that both heckle cylinders are similarly provided with a fan and tow-stripping apparatus; but only one set of apparatus is shewn in the drawing, to prevent unnecessary complexity.

Under this head of the invention, the patentee claims, Firstly,—the general arrangement of parts, whereby he is enabled to heckle both sides of a strick of flax by passing it once through the machine, and without turning the strick. Secondly,—giving a continuous traverse-motion to the guides or carriers of the flax-holders, whereby he is enabled to submit the flax to the action of the heckles, without the necessity for any reverse or intermittent motion to effect the proper heckling of the flax. Thirdly,—bringing the flax into contact with the heckles by means of atmospheric pressure, and causing a blast of air to impinge upon the back of the heckles, and thereby force off the tow from the heckle-pins.

The second head of this invention consists in improvements in the construction of card-cylinders and porcupine rollers, and in machinery to be used in the manufacture of the same. The patentee constructs the working surface of the cylinders of carding-engines, of metal plates, provided with steel teeth; and, instead of setting the plates around the cylinder in lines parallel with the axis, or in slanting parallel lines, he fixes them helically: by which means he is enabled to prevent the buckling of the metal, and to restore the plates to a proper degree of surface convexity, which they are liable to lose during the operation of driving in the steel pins.

Another advantage peculiar to the improved construction of card-cylinder is, that the pins will be set with such uniformity as to be tangents of one and the same circle. This will also be the case with the pins of the porcupine-rollers: which rollers it is proposed to form of cylinders of brass or other suitable metal, instead of constructing them of segments, as at present. The method of setting the pins at one common angle to the periphery of the cylinder from which they project, will be clearly understood when the machinery used for drilling the holes for their insertion, and for fixing them in their sockets, is described. The drilling-machine—which greatly resembles a slide-rest lathe in construction—is represented at figs. 5, and 6,—fig. 5, being a plan view, and fig. 6, a partial front view of the same. The plates to cover the cylinder of a carding-engine are fixed temporarily upon a

cylinder *a*, mounted upon a mandril. This cylinder is caused to move round at intervals, so as to allow the drill, which has an intermittent lateral motion, to drill the holes in the plates, wherein the steel pins are inserted, in helical lines, as shewn at fig. 5. The drill is mounted on a sliding-bed *b*, actuated by a traverse-screw *c*; and the amount of each lateral movement of the drill is regulated in the ordinary manner. Rotary motion is given to the drill by a band from any first mover passing over the drill-pulley; and rotary motion being given to the traverse-screw by hand, it is communicated through a train of wheels to a worm-shaft *d*, the worm of which takes into and drives a worm-wheel *e*, on the spindle *f*, of the headstock. On the same spindle is a worm-wheel *g*, which carries a square socket, to receive one end of the mandril; and this wheel *g*, gears into a worm on a vertical shaft *h*, that carries at its upper end a pinion in gear with a pinion *i*. The pinion *i*, is provided with a handle for turning it; and when the motion obtained from the traverse-screw *c*, has moved round the cylinder *a*, the proper distance to give the required helical direction to the row of drilled holes, the pinion *i*, is turned round once,—whereby the cylinder *a*, receives an axial motion of a determinate amount, equal to the distance required between the rows of drilled holes. The action of the machine then proceeds as before. As the line of traverse of the drill is parallel with the axis of the cylinder *a*, and as that cylinder is moved round a certain determinate distance after the drilling of every hole, each row of holes will form a portion of a helix; and the pins, when set in the pierced plates, will all stand at the same relative angle to a radius line, drawn from the centre of the cylinder to the point of intersection of the axis of the pins with the surface of the cylinder.

The pins may be fixed in the pierced plates, after they are removed from the cylinder *a*, by means of the apparatus shewn in side elevation at fig. 7, and in end view at fig. 8; but the principal use of this apparatus is to fix the pins of porcupine rollers, or the smaller cylinders of carding-engines, and thereby allow of those rollers or cylinders being made of drawn tubes, instead of sectional pieces of metal. *a*, is a hand-lever, working on a fulcrum *b*, and jointed to a link-piece *c*, which connects it with a lever *d*, having its fulcrum at *e*. The outer extremity of this lever carries a small hammer-head; and the amount of oscillation of the lever, and consequent rise and fall of the hammer, is determined by a set-screw *f*. The pierced cylinder is placed over the hammer end of the lever *d*, and held there by hand,—a row of pins having pre-

viously been inserted therein, from the inside, by the workman. The cylinder is steadied by resting upon the plate *g*,—and the hand-lever being worked by the attendant, the hammer is made to fall and drive in the pins beneath it. A line is drawn on the plate *g*, to shew the proper distance that the points should protrude; and when the points of the depressed pins cut this line, the cylinder is drawn forward, and other pins, in the same line, are, in succession, brought under the hammer, until the line is completed. The cylinder is then removed and another line of pins inserted; and so on until the whole cylinder is completed.

Under this head of the invention, the patentee claims, First,—the peculiar construction of card-cylinders and porcupine cylinders or rollers, as above set forth. Secondly,—the arrangement of machinery for drilling helical lines of holes in the plates and cylinders. Thirdly,—the mode of driving pins into card-cylinder plates and porcupine cylinders or rollers, as above explained.

The third head of this invention refers to a novel construction of circular comb-machine. Fig. 9, is a plan view of the machine, and fig. 10, is a partial sectional elevation thereof. A, A, is the main framing, provided with two standards A*, A*, which are slotted at their upper ends to receive a rod B. From this rod the frame C, that carries the comb, is pendent, and is capable of oscillating thereon. Mounted on a central boss of the frame C, is a worm-wheel D, and to it the circular comb E, is bolted. F, is an endless feed-apron, provided, at the front of the machine, for conveying the material that is to be operated upon, to a porcupine roller G, which presents it to the comb-teeth. At the back of the machine are the drawing-off rollers H, mounted in bearings on the frame C, and therefore partaking of the oscillating motion of the comb, and always being at a uniform distance from the teeth thereof. The action of this machine is as follows:—Motion is communicated through the pulley *a*, to the driving-shaft *b*; and from this shaft by the pair of pinions *d*, to the pinions *e*, which are mounted on studs projecting from the framing. These pinions are connected together by an excentric shaft *c*, which turns in bearings in the frame C, and carries a pinion *f*, in gear with a pinion *h*, on the shaft *i*. This shaft *i*, is provided with a worm *k*, for actuating the worm-wheel D, and thereby rotating the circular comb E. *g*, is another pinion on the shaft *c*, which takes into a pinion on the axis of the top taking-off roller H, and thereby drives these rollers, which are geared together as usual. On the end of the shaft *b*, is a

pinion *l*, which transmits motion, through the train of wheels shewn, to the axis of the porcupine roller G. This axis *o*, also carries a pinion, which takes into a pinion on the axis of the near roller of the endless feed-apron. By this train of gearing the several parts of the machine are put in motion; and, at the same time that the comb rotates, an oscillating motion is given to the same by reason of the excentric connection of the revolving pinions *e*, *e*, with the shaft *c*, which, as before stated, has its bearings in the pendent frame C. The comb will thus be made to approach to, and recede from, the porcupine roller, and thereby feed itself with the material to be operated upon; whilst at the same time the material that has been opened by the comb-teeth will be taken off by the rollers H, which, by being mounted on the frame C, always follow the oscillating motions of the comb.

Under this head, the patentee claims the arrangement of parts described, or any mere modification thereof, for giving an oscillating motion to rotary combs.

The last part of the invention consists in an arrangement of steam-engine, particularly designed for driving flax and woollen mills, and for other uses where smoothness of action is desirable.

Fig. 11, is a side elevation of a pair of oscillating engines, constructed according to this part of the invention; and fig. 12, is a plan view, with one engine in section, the better to shew its construction. The principal object of the improvements is to render the action of the engines more smooth than heretofore, and thereby prevent the effect of the reciprocating motion of the pistons being communicated to the mill-shafting and the machinery in connection therewith. For this purpose, two cylinders are used, placed concentrically,—the smaller cylinder B, within the cylinder A. In the cylinder B, high-pressure steam is employed; and after it has forced the piston B*, to the end of its course, the supply is cut off, and a communication is opened between the two cylinders, to allow the steam to escape into the cylinder A, and act upon the annular piston A*. The piston-rod of the cylinder B, is connected by a crank-arm to a shaft C, on which a large cog-wheel D, is mounted; and the cross-head of the rods of the annular piston A*, is connected, by a crank-arm, with a shaft E, which carries a cog-wheel F, of similar pitch to the wheel D. Into these wheels gears an intermediate pinion G, which, receiving motion simultaneously from the two wheels D, and F, transmits the same, through its shaft, to the mill-shafting. The valves used in this engine are of the ordinary construction.

Fig. 13, shews the form of steam-ways in the cylinder heads. The dotted lines *z*, represent a rod for working the air-pump of the condenser. The trunnions of the engine are made hollow, as usual in oscillating engines, for the purpose of supplying steam thereto, and exhausting it therefrom; which steam passes along the steam-ways, and first enters the small cylinder B; but, simultaneously with the steam that last entered the engine acting upon the piston of the cylinder B, the steam on the other side of the piston will be escaping into the cylinder A, and acting upon the piston A*. By this means a smoothness and uniformity of action will be attained in the engine; and the point of resistance, instead of being the trunnions (and thereby causing a large amount of friction) will be transferred to the pistons, which, moving simultaneously in opposite directions, will neutralize that resistance, and leave the trunnions to sustain merely the weight of the engine. If these engines are constructed in pairs, as shewn, a uniformity of rotary motion will be given to the pinion e, far exceeding that which is ordinarily transmitted from reciprocating engines. If thought desirable, the principle of construction of this improved engine may be carried out by exhausting the cylinder, which receives the steam direct from the boiler, into two small cylinders, instead of the annular cylinder; and, in this case, the piston-rods of these two cylinders will be connected, like the annular piston-rods, by a cross-head, and act in like manner on the central driving-shaft.

Under this head, the patentee claims, the so arranging the oscillating steam-engine that the steam, after being made to act upon the piston of one cylinder, may be exhausted into another cylinder, or a pair of cylinders (in the manner of the Woolf's engine), and thereby the piston of the high-pressure cylinder, and the piston of the low-pressure cylinder, or the pistons of the low-pressure cylinders (as the case may be), will be caused to travel simultaneously, and in opposite directions, as above described.—[*Inrolled April,* 1851.]

To SAMUEL ALLEN, jun., *of Birmingham, in the county of Warwick, manufacturer, for certain improvements in the manufacture of buttons.*—[Sealed 1st February, 1851.]

THIS invention relates, first, to an improved method of constructing what are known as sewn-through buttons; and, secondly, to an improved method of manufacturing florentine or covered buttons.

The sewn-through button, constructed according to the first part of this invention, is composed, first, of what the patentee terms a "cupped ring" of metal, represented in plan view and section by figs. 1, in Plate V; secondly, of a disc of covering material, which is double, consisting of a coarse fabric for the lining of the covering, and a finer fabric for the external covering; and thirdly, of a metal ring, shewn in plan view and section by figs. 2. To produce the button, the cupped ring *a*, is placed upon the disc of covering material, the edge of the latter is gathered in, the ring *b*, is placed upon it, and then the rim of the cupped ring is spread out or rivetted (as exhibited in the section of a finished button at fig. 3,), whereby it is made to press upon and hold the covering material securely.

The second part of the invention is carried out in a similar manner to that above described, but with the difference represented in the section, fig. 4,—viz., a blank or disc of metal *d*, is placed immediately behind the covering fabric *c*, for the purpose of preserving the front of the button in a flat state; and between this blank or disc and the cupped ring *a*, is introduced a disc of shank cloth *e*, which has been forced into the opening or neck of the cupped ring, as represented. The several parts of this button are put together in the manner described with reference to the improved sewn-through button. The covering material of the improved florentine or covered button need not be double.

The patentee claims the method of constructing sewn-through buttons above described and represented in the drawings,—that is to say, by gathering the edge of the disc of covering material to the neck of the cupped ring constituting the body of the button, and securing the same by the pressure of the ring which constitutes the back of the said button,—the said ring being secured by the spreading out or rivetting of the neck of the cupped ring constituting the body of the button. Also the application of the same method to the manufacture of florentine or covered buttons, with the modifications hereinbefore described and represented in the drawings.—[*Inrolled August*, 1851.]

To John Fielding Empson, *of Birmingham, for improvements in the manufacture of buttons.*—[Sealed 27th May, 1851.]

The subject of this invention is the application of thread or yarn of silk, cotton, or other material, to die and pressure-

made buttons, for the purpose of strengthening and ornamenting the same.

In Plate V., fig. 5, exhibits a plain die and pressure-made button, to which, in order to strengthen or ornament the same, the patentee applies thread or yarn, in like manner to what has been practised when making "wire buttons," and "leek buttons," as will be understood on referring to figs. 6, 7, and 8, which represent three buttons, with the thread or yarn applied thereto. The ornament or device produced by the application of the thread or yarn may be varied; and, instead of employing the exact form and make of die and pressure-made button shewn at fig. 5, others may be employed, and have thread or yarn applied to them; and such thread or yarn may be of the same color as the button, or of a different color.

The patentee claims, as his invention, the applying thread or yarn of silk, cotton, or other material or materials, to die and pressure-made buttons, as above stated.—[*Inrolled November*, 1851.]

To WILLIAM ELLIOTT, *of Birmingham, manufacturer, for improvements in the manufacture of covered buttons.*—[Sealed 19th December, 1851.]

THIS invention consists, firstly, in the application of back shells or rings, with serrated openings, to the manufacture of die and pressure-made covered buttons, with flexible shanks; and secondly, in the application of metal discs, with serrated edges, to the manufacture of die and pressure-made covered buttons, having covered backs.

Fig. 9, in Plate V., shews a disc or annular metal plate, with the opening or inner edge thereof toothed or serrated; and fig. 10, exhibits, in section, a back shell for a button formed therefrom, having the teeth or serrated edge turned inwards: hence, when a button is made with such a back or ring, the tuft of shank-cloth protrudes through the opening, and the inner portion of the cloth will be pressed between the teeth and the inner filling of paper or button-board; and thereby the piece of fabric or shank will be more securely held than when a back shell, with a plain or unserrated opening, is employed.

Fig. 11, represents a metal disc with a serrated edge, to be used, according to the second part of this invention, in the manufacture of die and pressure-made buttons, having covered backs. In making the button, the back covering fabric is

placed over the die; then the collar is put thereon, and the paper filling (which should be soft and spongy) is placed in the collar; after which the serrated disc is introduced; and the parts are then pressed in the die or mould, as heretofore, and the button finished in the ordinary manner.

The patentee claims, First,—the application of back-shells or rings, with serrated openings, in the manufacture of die and pressure-made covered buttons, with flexible shanks. Secondly,—the application of metal discs, with serrated edges, in the manufacture of die and pressure-made covered buttons, having covered backs.—[*Inrolled June,* 1852.]

To WILLIAM STIRLING LACON, *of Great Yarmouth, Norfolk, Gent., for improvements in the means of suspending ships' boats, and of lowering the same into the water.*—[Sealed 23rd February, 1852.]

THE object of this invention is so to suspend ships' boats at the sides or stern of a vessel, that in the case of any sudden emergency, such as the conflagration or foundering of a vessel, her boats may be readily lowered and put to sea, without the risk of the tackles, or other contrivances which connect the boats to the ship, retarding the operations of lowering and floating them clear of the ship.

The manner in which the patentee overcomes the difficulties hitherto attendant on the lowering of ships' boats during tempests, on dark nights, and at periods of excitement and danger, is, by suspending the boats from chains or ropes, which pass over the davits of the ship, and thence down to a winch or windlass, round which they are wound, but are attached thereto in such a manner that, when the winch is free to revolve, the ropes or chains will unship or disengage themselves from their attachment by their own weight. By this means he prevents the possibility of the ship, in its onward progress through a rough sea, dragging forward a lowered boat and capsizing or swamping it;—the weight of the chains or ropes, to say nothing of the resistance of the boat, being sufficient to disconnect them from the winch, and thereby render the boat free of the ship.

In Plate V., fig. 1, represents the inner side of a ship's bulwark, with a boat suspended, according to this invention, from the davits at the side of the ship—and also the apparatus employed for lowering the boat into the water; and fig. 2, is a cross section of the same. *a, a,* are two davits, or iron

brackets, firmly secured to the bulwarks of the ship, and provided with sheaves or friction pulleys *c*, over which the ropes or chains *b*, *b*, for supporting the boat, pass. The boat may be hoisted up at sea, if desired, by means of the ordinary tackle, and, when thus hoisted up, permanently retained in that position, by attaching the ropes or chains to the boat by the ordinary method in use. The ropes or chains *b*, *b*, pass down from the davits to conical barrels *e*, *e*, and are connected thereto by the last link in each chain, or an eye at the extremity of the rope, hooking on to a curved pin *d*, projecting from the periphery of its barrel (see the enlarged detached view, fig. 3.). These barrels are mounted on a shaft *f*, which turns in bearings in the bracket pieces *g*, *g*. The barrels *e*, *e*, are caused to rotate by the means hereafter described, for the purpose of tightening the suspending chains or ropes, and causing them to sustain the weight of the boat; and the tackles before mentioned, as employed for hoisting up the boat, are then removed. At about the middle of its length the shaft *f*, carries a large friction-pulley *h*, to which a ratchet-wheel *i*, is affixed. Around this pulley *h*, a friction-strap *k*, is placed; and the ends of the strap are jointed to a lever *l*, which works on a fulcrum-pin *m*. Into the teeth of the ratchet-wheel a catch, projecting from a lever *n*, which works on a pin *o*, takes, for the purpose of preventing the running down of the chains or ropes *b*, *b*, by the rotation of the barrels, and is kept forward in its place by means of a spring *q*. The levers *l*, *n*, are set fast by means of the pins *p*, and *p**, (see the detached view fig. 4,) which are readily withdrawn when the apparatus is to be brought into operation.

Let it now be understood, that the boat, which has been raised to the position shewn, is required to be lowered into the water. The seaman, to whom this duty is assigned, first pulls forward the lever *l*, in order to make the friction-strap *k*, retain its hold of the friction-pulley *h*, and thus prevent the premature revolution of the shaft *f*. He then thrusts back the lever *n*, and so releases the catch from the teeth of the ratchet-wheel *i*,—the lever end being kept back by means of the pin *p**, as shewn at fig. 4. On loosening the gripe of the friction-strap *k*, the boat will descend by its own gravity and cause the chains or ropes to unwind from the barrels *e*, *e*. When the boat has reached the water, the weight of the chains or ropes will, if the shaft *f*, is still free to revolve, pull round the barrels, until, by the slipping of the last link of each chain (or the eye at the extremity of the rope) from the projecting pin *d*, of its respective barrel, the ropes or chains fall away

from the ship, and consequently free the boat of its connection with the ship. In order to prevent the boat from running down into the water too rapidly, it is only necessary for the seaman to keep the friction-strap in contact with the pulley *h*, by holding the lever *l*, in its forward position; and thus any requisite amount of retardation may be put on the rotation of the barrels *e*, *e*, and consequently on the descent of the suspending chains or ropes. If desirable, the shaft *f*, may be furnished with a cog-wheel, for the purpose of gearing into a pinion mounted on a short shaft, provided with a winch-handle, by turning which, the boat may be hoisted up; or the winding of the suspending ropes or chains *b*, *b*, on to the barrels may be effected either when the ropes or chains are connected to or are free of the boat; or the ordinary hand-spike may be used to raise the boat to its elevated position, instead of employing the tackles, as at present.

The patentee does not confine himself to the precise arrangement of apparatus above described for carrying out his invention, but he claims, First,—the suspending of ships' boats by chains or ropes, which are capable of disengaging themselves by their own weight from the ship, when once the lowering of the boat is accomplished. Secondly,—the employment of a friction-pulley and friction-strap, or other analogous contrivance, for regulating the descent of ships' boats into the water. And, Thirdly,—the means hereinbefore described for running out the suspending chains or ropes uniformly,—whereby the dangers consequent on lowering one end of a boat quicker than the other are avoided.—[*Inrolled August*, 1852.]

To JAMES PILLANS WILSON *and* GEORGE FERGUSSON WILSON, *of Wandsworth, in the county of Surrey, Gents., for improvements in the preparation of wool for the manufacture of woollen and other fabrics, and in the process of obtaining materials to be used for that purpose,—being a communication.*—[Sealed 22nd January, 1852.]

THIS invention relates to improvements in the substitution of oleic acid for the more expensive oils commonly employed in the preparation of wool for the manufacture of woollen and other fabrics.

The patentees state, that they are aware that, before palm oil had been brought into extensive use for making fatty acids, and before the introduction of the process of distilling fatty acids, it was proposed to employ the tallow oil of commerce

in such preparation of wool; but such tallow oil did not come into use—being found to prevent the wool from working freely and to rust the cards, and being also considered objectionable on account of its dark color. The present invention is founded on the discovery, that the two former objections were wholly or mainly attributable to the fact that the tallow oil contained some portions of the solid matter of the fat, and also some of the mineral acid used in the manufacture of the fatty acids.

This invention consists partly in the application to the preparation of wool, instead of tallow oil of commerce, of oleic acid, obtained from distilled fatty acids, and particularly, on account of cheapness, of oleic acid obtained from the distilled fatty acids of palm oil,—the same being found preferable to tallow oil on account of its freedom, or comparative freedom, from mineral acid, and by reason of its lighter color. This invention likewise consists partly in the use of means for preparing oleic acid generally to be used as a material in the preparation of wool. The process preferred is, to store the oleic acid in casks, or otherwise, in a situation where it is exposed to the temperature of the outer air, and to keep it in such situation until it has been subjected to cold winter weather for not less than ten days—the patentees preferring the greatest degree of cold and longest continuance of storing that can be conveniently obtained. Then, during the continuance of the cold weather, and at the greatest degree of cold conveniently obtainable, the oleic acid is subjected to hydraulic or other suitable pressure, until all the fluid that can be obtained therefrom is expressed. The expressed product is allowed to remain exposed, in cisterns, to the temperature of the outer air, at the lowest degree of cold that can be conveniently obtained, and for a period of not less than six days. The liquid oleic acid is then drawn off from the upper part of the cisterns—leaving at the bottom any solid matter that may have been deposited, and from which a further quantity of liquid may be obtained by bagging and pressure.

Unless the oleic acid operated upon was produced in summer, or at a temperature materially higher than that at which the above-mentioned processes are carried on, it may be found that it does not solidify sufficiently to be subjected to pressure; and, in that case, the patentees bag it instead of pressing it, and afterwards expose the fluid product of bagging in cisterns, as before stated, and draw off the liquid product; and any solid deposit therefrom may likewise be treated as above mentioned.

The fluid oleic acid, obtained by the above processes, is now to be operated upon, in order to remove therefrom any admixture of mineral acid. To effect this, it has been found best to wash the fluid oleic acid by boiling the same, by free steam, with its own weight of water, for half an hour; after which the water is allowed to separate from the oleic acid; and then it is preferred to distil the oleic acid with steam, especially if the fatty acids, from which it was produced, were not distilled. Or, in cases where distillation cannot be conveniently performed, the process of washing is repeated, by again boiling the fluid oleic acid with its own weight of fresh water, in the manner before described.

The fluid oleic acid, obtained by the above processes, is to be used in the preparation of wool, in the same manner as the oils hitherto employed.

The patentees claim, First,—the using, in the preparation of wool for the manufacture of woollen and other fabrics, of oleic acid obtained from distilled fatty acids. Secondly,—the using, in the preparation of wool for the manufacture of woollen and other fabrics, of oleic acid, which has been treated by a preparatory process, for the purpose of freeing the same from solid matter and mineral acid. And they claim the process of obtaining oleic acid, freed from solid matter and mineral acid, as a material to be used in such preparation of wool, as aforesaid.—[*Inrolled July,* 1852.]

To JOHN DENNISON, *of the firm of John Dennison and Son, of Halifax, in the county of York, and* DAVID PEEL, *of the same place, manufacturers, for an improved lubricating compound.*—[Sealed 9th February, 1852.]

THE patentees remark, that in the preparation of wool, rag-wool, and flocks for spinning, it is usual to lubricate the same, either after they have been washed and scoured, or while in their primitive state, with oil (commonly gallipoli, olive, rape, or whale oil), in order to lay the fibres smooth, and so facilitate the operations of teazing, scribbling, slubbing, and spinning. The expenditure for such lubrication adds largely but unequally to the cost of manufacturing woollen yarns; as the coarsest and least valuable sorts of wool, rag-wool, and flocks require the largest quantities of oil. Now this invention consists in the manufacture of a new lubricating compound, which may be advantageously substituted for the oil, as it costs less and answers the purpose better; and it may also be applied,

in most cases, where a cheap, effectual, and innocuous means of lubrication is required.

To prepare the new lubricating compound, sea-weed is boiled to a jelly in water,—the quantity of water used being just sufficient to produce four gallons of jelly from each pound of sea-weed: for the sea-weed, kelp, prepared therefrom, or barilla, may be substituted; but the patentees prefer to use the sea-weed. The jelly is drawn off, leaving the refuse matters behind; and, while it is yet warm, gallipoli, olive, rape, whale, or some other oil of like properties, is added to it, in the proportion of from one-fourth to three-fourth parts of oil to each part of jelly,—the jelly and oil being thoroughly mixed by any suitable mechanical means. The patentees state, that they obtain by this process, at about less than half the cost of the oil, a compound which possesses much more valuable properties; for not only will the wool, rag-wool, or flocks, when treated therewith, be found easier to scribble or spin than when "blended" with oil, but the yarns, when made into warps, do not require to go through the ordinary operation of sizing—owing no doubt to the glutinous quality imparted to the material by the new compound—and they are ultimately stronger and better.

The patentees remark, that the proportions of the oil and jelly may, as above stated, vary from one to three-fourth parts of jelly to each part of oil;—that is to say, any combination of the materials within these limits, or thereabouts, will be useful for lubricating purposes; and they do not restrict themselves to any specific proportions; but they state, that the best proportion, at least for the woollen manufacture, is one part of the jelly for every part of oil.

In conclusion, the patentees claim, as their invention, the preparation of a compound for lubricating purposes, consisting partly of oil and partly of the jelly obtained as aforesaid, in the proportions hereinbefore specified, or in any other suitable proportions.—[*Inrolled August,* 1852.]

To Peter Wright, *of Dudley, in the county of Worcester, vice and anvil manufacturer, for improvements in the manufacture of anvils.*—[Sealed 20th January, 1852.]

According to the plan hitherto adopted of making anvils, these articles are constructed of several pieces, which are formed by forging into the proper shapes and are afterwards welded together. Anvils of the ordinary construction are

usually formed of from nine to fourteen pieces, according to the size; and the consequence of constructing them in this manner is, that they are very liable to be damaged in use by some of the numerous joints giving way, and thereby allowing portions of the anvil to be knocked off by the heavy blows to which they are frequently subjected. Now, the object of the invention is to manufacture anvils in such a manner as greatly to diminish their liability to be broken in the manner above described; and this object the patentee proposes to attain by making anvils in one or, at the most, in two solid pieces, which are formed or moulded in moulds or dies, instead of being forged.

In carrying the invention into effect, for making anvils in two pieces, one mode of proceeding is this:—Two hollow dies are prepared, one of which is in form the counterpart of the intended shape of the upper portion of the anvil (see fig. 1, Plate VI.), and the other the counterpart of the intended form of the "butt" or lower portion (see fig. 2). These dies or moulds may be made of cast-iron. Now, having brought a piece of iron, suitable for the purpose, to a welding heat, and worked it into something approaching the shape of the part of the anvil which it is destined to form, the operator places it in the corresponding die, and by the application of a series of blows, delivered by a forge or other large hammer, he causes the mass of heated iron to fill the die, and thus to assume the shape thereof. The same mode of proceeding is adopted both for the upper and lower parts of the anvil; and when the two pieces are completed, they are welded together, so as to form a block, having only one joint in it; and then the anvil is faced and finished in the ordinary manner.

Another mode of working for manufacturing an anvil in two pieces, by means of dies, is as follows:—Instead of the upper and lower parts of the anvil being made separately, and connected together by welding, as above described, the anvil may be made in two halves, counterparts of each other, as if the anvil were cut through longitudinally,—such halves being made in moulds or dies, of a corresponding shape, in the manner already described, and afterwards welded together, so as to form a block, having one longitudinal vertical junction, as shewn at fig. 3. Or, otherwise, the upper part may be made in a die, as first described, and then welded to a block, constructed by the old process of forging,—the upper part being that which it is most important to form in one solid piece.

In making the smaller sizes of anvils, the patentee forms

the whole in one piece:—For this purpose he uses plates of faggotted or piled iron, and having heated them in an ordinary furnace to a welding heat, he works the mass of iron into a shape approaching the shape of the anvil; he then places it in a die, of the form shewn at fig. 4, and hammers it into the shape of the entire anvil; and, finally, he faces and finishes it in the usual manner.

It will be obvious that, in making anvils in the several ways above described, the essential feature of the process is the use of moulds or dies, and of compression of the metal therein. And the patentee observes, that although, by the use of moulds or dies, he is enabled to manufacture anvils in one or two solid pieces, with a due regard to economy, yet, of course, he does not mean hereby to limit his invention to the making of anvils in one or two pieces;—the substance of it being the use of dies and compression, and not the particular number of pieces moulded. He accordingly claims the mode described of manufacturing anvils, by which he can make them in one or two pieces by forcibly compressing the metal, of which they are to be composed, in a die or dies; and he does not claim any other of the matters or things above described.—[*Inrolled July*, 1852.]

To Alfred Vincent Newton, *of the Office for Patents*, 66, *Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of iron hurdles or fences, and of certain other articles in the construction of which wire-work is or may be employed,—being a communication.*—[Sealed 12th December, 1850.]

This invention consists, firstly, in an improvement in the manufacture of woven metallic wire-work, whether made of iron or other metal,—such wire-work forming, or being intended to form, a component part of screens or sieves, roofs, frames of buildings, staircases, guards for trees, and fences of various descriptions.

The improvement in the manufacture of woven wire-work is effected by preparing the flexible wire, which is to constitute the warp and woof or filling, or either, of the fabric, by crimping or crinkling it, preparatory to its being used in the process of weaving or interlacing it together. This crimping operation consists in bending the wire to the same extent that the metal threads in woven wire-work are now bent by the action of a loom or weaving apparatus; and the improvement

refers to such flexible wire only as, from its great size, has not generally been deemed capable of being economically woven or interlaced to form wire-work. The respective bends, flexures, or corrugations in the wire must, of course, be made at such distances apart as shall correspond with the size of the meshes to be produced between the wires of the warp and filling; but, when such meshes are made of a very large size, it is found preferable to make the bends or crinkles three times as numerous as the meshes, or the length of straight wire between any two adjacent bends would otherwise be objectionable.

In Plate V., fig. 1, is a perspective representation of a piece of the improved woven wire-work, in which *a, a,* may be considered as the warp wires, and *b, b,* as the weft or filling wires, or *vice versâ,*—there not being any apparent difference between them in the manufactured article. Fig. 2, shews a crimped wire, seen laterally, as it makes a part of a piece of woven wire-work. In this figure, the wire is so drawn as to shew the manner in which it is sometimes preferred to crimp it when the meshes are to be of a very large size. Under this arrangement, it will be seen that there are two crinkles or bends between the adjacent crossing wires *e, e.* The woof or cross wires may be similarly crimped.

What the patentee claims, under this head of the invention, as an improvement in the manufacture of articles in which wire-work is or may be employed, is, the crimping of wires (to form such wire-work) before they are woven, and afterwards weaving or interlacing them together,—the crimping having been heretofore produced during the process of weaving; and, in consequence thereof, it has generally been deemed very difficult, if not practically impossible, to produce woven wire-work made with other than wires of small gauge, or such as could be bent easily or without the expenditure of much power. And this improved process, or mode of manufacturing woven wire-work, is claimed irrespective of any mechanism used to make the crimps or bends of the wires, or for the purpose of interlacing or weaving such wires together.

Another improvement in the manufacture of iron hurdles or fences, and certain other articles in which woven wrought-iron or metal wire is used, consists in the mode of making a surrounding frame to such woven wire or wires, and combining the wires with such surrounding frame. This improvement is represented at figs. 3, and 4, and is there exhibited in the shape of a panel or piece of fence. The fence is composed of wrought-iron or other proper metal wires or rods,

interlaced, and a metal frame,—the whole forming an ornamental and economic fence, combining lightness with strength and durability. The frame of the panel is composed of double bars *a*, a^1, of wrought-iron, rolled with a groove in them,—every part of the said frame being composed of such bars, put together as shewn in fig. 3, with the grooves turned inwards. They thus compose strong rails or upright posts, notwithstanding their lightness, so far as weight is concerned. The inner bars of this frame are drilled with holes, at proper distances apart, for the reception of the ends of the wires of the woven wire-work of the panel, which is composed of stout iron or metallic wires, generally about one-fourth of an inch, or greater, in diameter. After the flexible wires are woven together, their ends are passed through the holes in the inner grooved bar, and are subsequently turned or bent down into the groove, as shewn at *d*, fig. 3. This being done, the other grooved bar *a*, is next placed over the inner bar, so as to cover the ends of the wires; and it is properly secured thereto. The patentee does not confine himself to the use of two grooved bars, as it will be often sufficient to groove only one of the bars, viz., the inner or outer one,—the other being a simple flat bar, placed over and upon or under the groove of the other, as the case may require: which groove would, in such instance, be rolled or made of a depth sufficient to receive the bent ends of the wires. It is well known that it is a somewhat difficult matter to rivet down the end of a wire when in such a position,—such being necessary under other circumstances; but, by providing a groove for the ends of the wire to lie in, and bending them down therein, the necessity for rivetting is obviated, while, at the same time, a durable and cheap structure is produced. When the cap-rail or bar is used, such bar serves to make a finish and prevent the displacement of the ends of the wires. Should ornaments be applied to the top rail, as shewn at *e*, *e*, fig. 3, they may be formed with a split wrought-iron or flexible metallic pin *f*, as shewn at fig. 4. This split pin is inserted in a hole bored in the top bar; after which, the two parts of the pin are bent down or spread out upon the under surface of the bar, as represented by the dotted lines at fig. 4.

The patentee claims the above described mode of making fencing or woven wire panel work, substantially as hereinbefore explained and exhibited.—[*Inrolled June*, 1851.]

To WILLIAM LONGMAID, *of Beaumont-square, in the county of Middlesex, Gent., for improvements in obtaining gold.*—[Sealed 30th January, 1852.]

THIS invention consists in treating minerals, containing gold, in such manner that the quartz, or other minerals, are fused and become a fluid slag, when the gold is precipitated, either by its density or by its affinity for iron. The minerals to be so treated may consist of quartz, limestone, clay, sand, iron pyrites, or other minerals which contain gold.

In carrying out the invention, the patentee first reduces the minerals to a size that will pass through a sieve of three or more holes to the inch. If the auriferous mineral be quartz only, he adds thereto such ferruginous, earthy, and alkaline substances as will produce a fluid slag when subjected to the action of heat in a reverberatory furnace: calcined pyrites, oxide of iron, lime, fluor spar, or any alkaline matters, are suitable ingredients for producing the necessary fusion; and the patentee has found that 50 parts, by weight, of oxide of iron, 50 parts of lime, and 100 parts of quartz, form a good mixture. The mixed minerals are ground, in order to effect a perfect admixture thereof. The patentee states, that he prefers to select such minerals as are auriferous [for the purpose, we presume, of effecting the fusion of the auriferous mineral to be operated upon], when the same can readily be obtained, such as quartz, oxide of iron, lime, baryta, &c. A weighed quantity of the ground material, say two tons, is placed on the sole of a reverberatory furnace, and the door or hole in the roof, at which the charge is introduced, is closed. After the charge is well heated, it is stirred occasionally, which has the effect of rendering the slag more fluid. When the charge is well fused, if the gold existed in considerable quantity in the minerals under treatment, it will be mostly precipitated, by reason of its density; but it will happen that a portion of the gold, and sometimes the entire quantity, will be retained in solution or suspension in the slag. When this occurs, metallic iron (old boiler-plate will be a convenient form) is put into the furnace, which has the effect of precipitating the gold on to its surface. The gold is separated from the iron by immersing the same, whilst red hot, in molten lead; and the gold is afterwards extracted from the lead by the ordinary method of cupelling lead containing precious metals.

It is found advantageous to work a number of charges until a considerable quantity of gold has accumulated in the

bottom of the furnace,—taking care, when tapping off the slag from time to time, to leave sufficient to cover the gold. When it is necessary to withdraw the gold from the furnace, the bottom is fused as close as may be found convenient, and the remaining portion is taken out and broken up. The pulverized bottom is mixed with a suitable flux, and smelted in the manner above described for smelting the raw material. It is stated that, by this means, any sensible loss of gold is prevented.

The patentee says, that he does not confine himself to the precise details above described; as he is aware that they may be varied considerably without substantially departing from his invention.—[*Inrolled July*, 1852.]

To HENRY ADCOCK, *of Northumberland-street, Strand, in the county of Middlesex, civil engineer, for improvements in the manufacture of pipes, chimney-pots, and hollow vessels; also bricks, tiles, copings, columns, and other articles used in building houses and other structures.*—[Sealed 23rd October, 1851.]

THIS invention consists in melting the mineral, rock, or stony substance commonly known as basaltes, trap, rowley rag, or whinstone, or minerals of like structure and belonging to the same geological genus, and running the same in a fluid state into moulds suitably formed for producing castings of the desired shapes.

The material is put into a reverberatory or other suitable furnace, and melted either on the bed or bottom of the furnace or in crucibles; and it is then cast into moulds, in the same manner as when casting iron, brass, or other metal. Moulds of cast-iron are preferred to be used; and sometimes the external and internal surfaces thereof (prior to heating the same in an oven, or to casting into them) are brushed over with a mixture of finely-powdered charcoal and water, termed by iron-founders "blacking;" but, in most cases, and particularly when it is intended that the cast material shall have polished surfaces, the external and internal surfaces of the mould are brushed over with a mixture of black lead and water, and afterwards the internal surfaces, or those parts which give the impression, are polished with dry black lead. In casting polished surfaces, and in casting generally, the patentee finds it advantageous to heat the mould, and the core within it, to a bright red heat, or even beyond it, in an

oven, and to pour the liquid material into the mould while thus heated. On the rate of cooling will greatly depend the character of the cast material. If cast in moulds, sufficiently heated to allow it to retain its fluidity, or if heated in an oven in the mould, after it is cast, and thus brought to a liquid state, and, in either case, afterwards allowed to cool very slowly, the cast material will be a hard stony substance, assimilating closely in its fracture and appearance to the original material of which it is formed. A less degree of heat, or a less slow rate of cooling, will give to the cast material a similar appearance to marble. A still more rapid rate of cooling will leave the cast material of an opaque glassy structure, unless it be cast very thin, when it will be transparent or semi-transparent. It has been found convenient to build an oven at a lower level than the reverberatory or other furnace, and at the side thereof, so as to admit of casting from such furnace into the moulds while remaining in the oven, and afterwards applying such a degree of heat as may be required to keep the material in a melted state in the mould.

In making pipes, chimney-pots, and hollow vessels of a common kind, sand and loam-cores, such as are employed by iron-founders, may be used. For casting barrels, cylinders, pipes, and the like, which require internally a smooth surface, cast-iron cores, made in parts, may be used, so as to admit of the same being withdrawn as soon as the cast material is set, in order that the proper contraction of the cast material, while cooling, may take place. If it be desired, for any particular purpose, that the melted material should flow more freely, then a flux, such as soda, may be added; but it has not been found necessary to do so in ordinary cases.

The patentee claims the melting of the material above mentioned, and running it into suitable moulds to obtain castings of the same, as before described.—[*Inrolled April,* 1852.]

To James Macnee, *of Glasgow, N.B., merchant, for improvements in the manufacture or production of ornamental fabrics.*—[Sealed 20th January, 1852.]

The patentee commences his specification by remarking, that the several classes of woven fabrics technically known as zebras, and used for dresses, *robes de chambre,* certain kinds of shawls, and other articles of dress, are at present produced by the troublesome and expensive processes of winding, warp-

ing, and dyeing the yarns, and, finally, by an intricate system of weaving in the Jacquard or other complex harness loom. The fabrics so made have a plain or twilled even surface on the pattern side, whilst the reverse side is back-lashed or flushed,—that is, it has portions of weft-threads flushed or thrown over a larger or smaller number of the warp-threads by the action of the Jacquard or other harness in producing the required pattern; or, in another mode of manufacture, it has portions of the warp-threads similarly flushed over certain of the weft-threads.

Now the object of this invention is to produce new ornamental fabrics, of a similar class to the zebras, and which will present, in some respects, a more effective appearance than the zebras manufactured in the maner above described. The patentee produces such fabrics from any suitable textile materials or combinations (in a grey or white state, not dyed or printed), by plain weaving in the ordinary loom, or any other simple weaving mechanism,—merely arranging the heddles, or the warp or weft-threads, so that the goods may have one surface plain or twilled, and the reverse surface flushed, and possess a general resemblance, except in color and figure, to the result of the pattern-action of the Jacquard or other harness, in weaving the ornamental figure in zebras from colored threads. In producing zebras by the existing system of pattern-weaving, the flushed reversed side of the fabric is a necessary result of the varied or differential interlacing or crossing of the colored warp and weft-threads, due to the pattern-action. Now, a similar peculiarity is purposely produced in this new system of manufacture, in order that the goods may the more nearly resemble the same class of fabrics produced in the ordinary manner. The process of manufacture is afterwards completed by printing the required ornamental pattern upon the plain or twilled side of the fabric by the ordinary methods of printing.

By this new system, the goods are manufactured with the same ease and as expeditiously, or nearly so, as a plain fabric, whilst the effect of such goods is superior to that of goods made in the ordinary manner; and, further, they are produced at a cheaper rate. The finished goods bear a very strong resemblance to those of the zebra class,—the particular distinctions being, 1st, that the flushed surface of the fabric is of the natural color of the yarn in its plain undyed or unprinted state, except where the printing colors pass through from the pattern side; 2nd, the flushing is not necessarily irregular, as it must be when it is the result of the pattern-action in the

common zebra loom; 3rd, the colors being laid on the exterior of the fabric in a solid mass, are full, bright, and solid in appearance,—the dulling effect of the interference of the weft and warp-threads of different colors in the common zebra being avoided.

The patentee claims, First,—the manufacture of a new fabric of the zebra class, or nearly resembling zebras. Secondly,—the process or mode of manufacturing or producing such fabrics, as hereinbefore described. Thirdly,—the manufacture or production of a plain or unfigured fabric with a flushed reverse side, for the purpose above described.—[*Inrolled July*, 1852.]

Scientific Notices.

THE NEW PATENT LAW.

In our last number we stated that the efficient working of the new patent law depended greatly upon the rules and regulations which the Commissioners might think proper to adopt. We have now reason to believe that effectual means have been taken by the Commissioners to obtain such information as will enable them, if such thing be possible, to work out the Act according to the intentions of the legislature, and render it really and truly a boon to the inventive community. Our experience of Acts of Parliament does not warrant us in supposing that, in such documents, the *intention* of the legislature and *public advantage* are always to be found running in parallel lines: occasionally we find them crossing each others path,—now parting, then meeting again; and at other times they are to be seen taking a diverging course, and touching only at the starting point. We are happy to say, that the present Act is not a realization of the last-mentioned case; but yet the intent and the result are not always in harmony. A difficulty of some importance has presented itself in Clause XXIX., wherein provision is made for the filing, in both Edinburgh and Dublin, of a copy of the specification of every patent that is granted. It will be remembered that patents, obtained under the new Act, will extend over the whole of the United Kingdom—a most excellent provision, and one that has been long desired—and it follows, as a matter of necessity, that, in order for the Scotch and Irish Courts to have cognizance of existing patents, an official copy of the specifications must be recorded in those kingdoms.

For this purpose, it is ordered, in Clause XXIX., that "the Commissioners shall cause true copies of all specifications (other than provisional specifications), disclaimers, and memoranda of alterations, filed under, or in pursuance of, this Act, and of all provisional specifications, after the term of the provisional protection of the invention has expired, to be open to the inspection of the public at the Office of the Commissioners, and at the Offices in Edinburgh and Dublin, respectively, at all reasonable times, subject to such regulations as the Commissioners may direct." By this Clause, two questions are presented for solution,—1st, What kind of copies are to be filed? and, 2nd, By whom are these copies to be provided? These are undoubtedly points to be decided by the Commissioners; but, as they bear very closely upon the interests of inventors, it may not be amiss to call public attention to the subject, as an open discussion, among the parties interested, may serve to indicate the best means of meeting this legislative provision. Now, by Clause XXX., it is enacted, that all specifications, whether provisional or otherwise, shall be printed and published; and power is given to the Commissioners "to present copies of all such publications to such public libraries and museums as they may think fit." It would therefore appear to be the intention of the legislature that printed copies of the specifications are to be filed in Edinburgh and Dublin. This view we may consider as confirmed by Clause XXXIII., which enacts, that printed copies of specifications, disclaimers, and memoranda of alterations, shall be admissible as evidence in courts of law. If, then, this course be adopted, the patentee, who is now content with protection in England only, will not be saddled with the extra cost of preparing two copies of his specification, for filing in Scotland and Ireland. But, from this arises another question,—Is the patentee bound to defend his rights, in case of an infringement of his patent in one of the sister kingdoms, by reference to the printed copies issued by the Queen's printer? If he be compelled to do this—and it is manifest that, although the English Courts may accept, as evidence, the original recorded specification, this document will be inadmissible in the Courts of Scotland and Ireland—it behoves him to see that the copy is not merely literally correct, but, where drawings are annexed to his specification, that these also are intelligibly rendered: for, upon their correctness, the sufficiency of his specification, and, consequently, the validity of his patent, may rest. Thus, supposing an adverse verdict to be given against his patent in Scotland, by reason of the drawings, as copied by the engraver, being unintelligible, the

whole patent would be void. But it may be denied that there is more likelihood of incorrect or imperfect copies being made by the engraver or lithographic draughtsman than by the patentee or his agent. Let us look to the facts of the case. A specification is drawn up, describing a new arrangement of certain parts of any given machine,—say, for example, a loom. The specification may contain such an expression as this,—"Although I have thought it desirable to describe, and shew in the drawings, many parts which are common to looms of this class, yet I wish it to be understood, that I lay no claim to those parts which are shewn in outline; but I desire to secure, as of my invention, the arrangement of the several parts hereinbefore referred to, as colored red, blue, and yellow,—whereby I am enabled to obtain the results above set forth." How, we would ask, are these colors to be rendered? It is evident that the use of Baxter's very expensive process for printing in colors, or that of chromolithography, will be required. In either case, the printing, to say nothing of the preparation of the printing surfaces, is very expensive,—depending entirely upon the number of colors required. It may, however, be said, that this mode of describing machinery by the use of colors is unnecessary, and that, by dropping the practice, the difficulty may be avoided. Let us assume this to be the fact, and what does it bring us to? That specifications must be framed on a given model; and that, no matter what may be the peculiarities of the case, drawings must all conform to one undeviating plan, which shall admit of their being faithfully represented in black and white. But then what difficulties would not this entail upon the patentee? He is, we will say, describing a mode of producing a new textile fabric by the use of old machinery; and this he can only do by diagrams. He has, perhaps, ten or a dozen warps, which, according to the present system, are represented by different colors; and the weft-thread takes a corresponding number of courses, which are also denoted by different colors. When thus set out, the weaving process is intelligible enough; but, if debarred the use of colors, to what equivalent system of representation is the patentee to resort? Again, it is almost a universal practice with mechanical draughtsmen to shew the same parts in various positions in the same figure, by means of lines of different colors. This plan not only saves the necessity of making additional figures, but shews, at one glance, the action of the several parts. We might multiply these illustrations of the advantageous use of color in specification drawings; but enough has been said to shew that the enforcing of a practice that would virtually

negative the employment of color as an illustrative medium would, to say the least of it, produce considerable inconvenience. Instead of shewing, at a glance, of what material the several parts of a machine are to be constructed, this would have to be expressed in words; and the shading which has been found so serviceable in clearing up complex parts of drawings, would, if not required to be abandoned with the color, become far less satisfactory than at present. It will be understood, that the objections we have urged against printed copies of specifications apply only to their adoption as legal evidence; for other purposes they will be of great service, and will amply meet the requirements of the public, even if the drawings are given in outline, and on a reduced scale. But if the recorded copies in Scotland and Ireland are really and truly to be transcripts of the specifications deposited with the Commissioners by the patentee, it is a matter of some importance to decide by whom these copies are to be provided. The spirit of the Act, we have already said, would seem to exonerate the patentee from this liability; but then the filing of printed copies was evidently contemplated. If, therefore, it is shewn that the interests of patentees would suffer by complying with the intent of the Act, and that they would be advanced by a departure therefrom, it would seem to follow, that they who benefitted should bear the expenses consequent on a departure from the course marked out in the Act. On the other side, an inventor may argue,—I am content with protection in England; and why should I be compelled to provide two extra copies of my drawings for securing my rights in countries that do not require my manufactures,—more especially as the Commissioners can furnish their own printed copies at little or no cost? However this matter may be settled, it is certain that a uniformity of practice must exist; and it is no less certain that the advantage of the majority of patentees, so far as it is not inconsistent with common justice, should guide the decision of the Commissioners. That providing two facsimile copies of all specification drawings for inrolment in the sister kingdoms, at the cost of the public, would entail on the country a large annual expense, and require the outlay of a considerable sum for suitable drawing offices, there can be no doubt; but, independently of this, much time would of necessity elapse before the copies could be prepared; and, during this period, inventors in Scotland and Ireland would be in the dark as to what had been specified. We have estimated that the average cost of preparing these two copies would be £4. 10*s*. for every patent granted. The probable number of patents that will be granted per annum cannot, with any degree of confidence, be arrived at, as no data exists for calcula-

tion; and it still remains doubtful in the minds of the best authorities, whether we may expect to count them by hundreds, as heretofore, or by thousands, as in France, and in the United States. But, whatever may be the numbers, there does not appear to be any justice in taxing the community for what must, after all, be considered as a private object; nor do we think that patentees would, in general, desire it; for, if the preparation of these copies were left in their hands, they could furnish them at less cost than the Commissioners; and, consequent on the adoption of this course, patentees themselves would be responsible for the correctness of the documents, instead of the responsibility resting, as it otherwise must, upon irresponsible officials, possessing certainly no interest in, and probably no knowledge of, the matter on which they were engaged. On the whole, therefore, it would seem desirable, that an order should be made for the simultaneous filing, in the three kingdoms, of copies of specifications and drawings, as they fall due. In some cases it would undoubtedly be a heavy tax on patentees, supposing these documents to extend to the length which they now frequently attain; but, as graduated stamp duties and enrolment fees are abolished by the new Act, it may be sound policy, on the part of the Commissioners, to substitute this tax in lieu thereof, and thereby put a wholesome check on verbosity and uncalled-for advertisement in the specifications of patented inventions. These are our views, after a careful consideration of the subject under various aspects: if they should meet the approval of inventors—well; and if not, means should be taken to inform the Commissioners of the fact,—as, on the one hand, the evil of having to rely, in courts of law, on printed copies, is obvious; and, on the other, it may be taken for granted, that no modern government will rush into untold expenses, when a reasonable pretext exists for laying the burden upon private shoulders.

ON THE STEAMBOATS OF THE WESTERN WATERS OF THE UNITED STATES.

BY J. V. MERRICK.

An examination of some of the details of a table, forming part of a report of proceedings in the Wheeling Bridge case, and containing (what are believed to be) reliable data respecting some of the steamboats now running on the Ohio and Mississippi rivers, will shew conclusively a very curious fact respecting the practice of Western engineers, which, although it may before have been noticed, has been hitherto overlooked or ignored in the construction of their machinery.

The Western steamboats are made on a peculiar type, which is to be found principally in that section of the country, and whose existence at this stage of improvement in river navigation only serves to shew how far prejudice, and a spirit of servile imitation, can prevent advances dictated by science, or by successful experience elsewhere. They are, with but trifling exceptions, propelled by a pair of high-pressure inclined engines, bolted to timber frames, and with very long wooden connecting-rods,—each engine being attached independently to its own wheel. They are placed on deck (which is within two or three feet of the surface of the water), and, with the boilers, occupy from one-third to one-half the length of the boat, and the whole breadth inside the wheel-houses. The valves are of the description known as "poppet," which, till within a very recent period, were made single, and required considerable power to work them, but are "double" (or balanced) on the new engines. Steam and exhaust-valves are worked by separate cams, attached to their respective rock-shafts. Provision is made for connecting these shafts when it is desired to work full stroke; but the cut-off is not adjustable. Each valve is lifted by a lever, in the usual "safety-valve" style; which lever stands parallel to the cylinder, and covers the tappets on the rock-shafts,—the latter of course crossing the cylinder near the middle of its length. The valves are not allowed to lift high enough to give an area of passage equal to their own, which, in itself, is usually smaller than given by the usual English and our own Eastern practice.

The boilers are cylindrical, with two flues; are set in brick-work, and placed upon the deck forward of the engines; furnaces forward; and the flame, &c., passing under the shells to the after end, returns through the flues. It is the universal custom to carry steam of a very high pressure in the boilers,—a circumstance which has now become a sort of proverb; and the results of which, combined occasionally with those of an opposite error, in respect to the water level, may be found in the records of steamboat disasters in the United States, and present a lamentable instance of reckless disregard for the safety of human life.

The object of the present article is to shew that this high pressure, with all its attending evils, is entirely unnecessary; and it is to this "curious fact," before adverted to, that it is now desired to call attention.

The application of an indicator to any of these engines would demonstrate this point; but as such attachment has not been made, so far at least as I am aware, recourse must be had to another method of proof.

The economical efficiency of a boiler depends on the relative proportions of its effective heating surface, grate surface, and least cross section of flues or chimney, and the rapidity of combustion, or consumption of fuel. The greater the rapidity with which combustion is carried on, the less perfect is it, and hence the less economical will it be. Hence (within certain limits), that boiler which burns least fuel per square foot of grate, in a

given time, or, in other words, which has a larger grate to burn the same fuel, evaporates the greatest amount of water by the combustion of a pound of fuel. That boiler which presents the greatest extent of effective heating surface to the action of the combustible, will, of course, draw from it the greatest useful effect with a given velocity of draft. Finally, the less the velocity of draft requisite, the greater useful effect will be obtained, since the products of combustion have more time to communicate their heat.

To compare, then, the circumstances attending the consumption of fuel with those of other instances, I shall take an average of five Western packets (in order to obtain a mean result), and compare it with some steamer whose consumption per square foot of grate is about the same as theirs.

On referring to Bartol's *Marine Boilers*, we find that the steamer Mayflower, running on Lake Erie, consumes 6160 lbs. of bituminous coal per hour, on a grate 151 square feet, or 40·8 lbs. per square foot per hour; total heating surface 4791 square feet, or ·778 feet of surface per pound of coal per hour; useful effect produced, 5·94 lbs. of water per pound of coal.*

In the five packets before alluded to, and which are hereafter specified by name, the average consumption of fuel is 3254 lbs. of bituminous coal or its equivalent per hour, on a grate of an average area of 79·2 square feet, or 40·87 lbs. per square foot per hour;—total heating surface averages 1940 square feet, or ·596 feet of surface per pound of fuel per hour,—being but ·766 that of the Mayflower.

The velocity of draft under these circumstances, since the same quantity of coal is burned per square foot of grate, would depend on the relation between the respective areas of flue and grate. In the five packets it is as follows:—

	Consumption of bituminous coal per hour per sq. ft. grate.	Ratios of areas of grate to flues.
Clipper, No. 2	43·00	1 to ·1250
Hibernia, No. 2	37·37	1 to ·1336
Bostona	39·06	1 to ·1780
Buckeye State	49·72	1 to ·1830
Messenger, No. 2	35·22	1 to ·1654
Mean	40·87	1 to ·1570

or an average ratio of 1 to ·1570; while, in the Mayflower, it is 1 to ·1780; whence it follows, that, to allow the same amount of air, &c., to pass, the velocity required in the Western boats must be to that in the boiler of the Mayflower as 1·134 to 1·000; and hence that, in the latter case, more useful effect would probably be obtained from the fuel.

Finally, the boiler of the Mayflower is a single "rising flue;" while those of the Western boats are cylindrical; and it is known that, in the latter form, the proportion of *effective* in the total heating surface is less than in the former. Since, then, all the

* The author states it at 6·3 lbs.; but informs us, at the end of the work, that this is based on the supposition, that there is no difference between boiler and cylinder-pressure. Assuming this at 2 lbs., which may be called a minimum, 5·94 is the real coefficient.

circumstances are concurrent to more perfect combustion in the boiler of the Mayflower, and since, in that case, the useful effect is as 5·94 to 1, it appears that from 4½ to 5½ to 1 will be a fair allowance as a maximum effect in the Western boats. In order to allow for the difference in temperature of the water entering the boilers, and to ensure a perfectly fair comparison, I shall employ in it the higher number, or 5·5 lbs. of water to a pound of fuel, as the maximum useful effect.

Having determined this point, it remains to shew that, with this maximum of evaporation, it is impossible to produce a volume of steam sufficient to fill the cylinders, at their point of cutting off, and number of revolutions per minute, with steam of anything like the pressure carried in the boilers.

Referring to the table, we obtain the following calculation, which is tabulated for comparison:—

	Names of Packets.	Space displ'nt of piston for each double stroke at point of cutting off.	Revolutions per minute.	Consequent volume of steam used per minute.	Consumption of fuel per minute.	Calculated volume of water evaporated at the above standard.	Ratio vol steam to vol. water.
		Cubic feet.		Cubic feet.	lbs.	Cubic feet.	
1	Clipper, No. 2 ...	58·61	22	1289	42·42	3·633	342
2	Hibernia, No. 2 .	91·66	19	1742	49·81	4·785	394
3	Bostona............	77·66	20	1553	52·09	4·583	339
4	Buckeye State...	91·66	18	1650	71·35	6·279	261
5	Messenger, No. 2	78·59	19	1493	50·53	5·362	276
		Average		1545	53·24	4·928	322·4

Giving, as an average result, a volume whose corresponding pressure is 74·7 lbs. above the atmosphere; while that carried in the boilers was, respectively, 150, 150, 145, 140, and 150: average, 147 lbs.;—difference between boiler-pressure and maximum average cylinder-pressure, 72·3 lbs.

I am not to be understood as saying that the pressure never exceeds this point; far from it—it is very possible that at the commencement of a stroke, or at some point in it, it may be higher; but simply, that the average pressure during the time for the admission of steam, cannot differ greatly from the one named.

It may be very true, that the consumption of fuel is, of all other data respecting the performance of an engine and boilers, the least reliable: since different firing, different qualities of coal, and differently arranged boiler surface, &c., may modify the useful effect within wide limits. But when it is considered that, on the one hand, the Mayflower is a boat (running on Lake Erie) burning the same quality of fuel as the Western boats—that her consumption is the average of her running trips—that it was certainly not to the interest of the reporter to magnify that consumption, when it was known that the report was intended for publication; and, on the other hand, that an average of five packets, running on different routes, and supposed to have all the modern improvements, &c., was taken with an average of the irrunning consumption through the whole trip—that it was

certainly not to the interest of those reporting their performance to name a less amount of fuel than the true consumption (since, other things being the same, a diminished consumption would require a diminished height of chimney), it is certainly, in view of these points, not possible to conceive that the maximum pressure in the cylinders, as calculated, can vary greatly from that actually maintained.

It will be observed, that the least volume in the table just given (that of No. 4) gives a pressure of 96·6 lbs. above the atmosphere; while the greatest volume (that of No. 2) gives a pressure of 58 lbs.: mean, 77·3.

Why then, it will be asked, is this tremendous pressure carried, if so useless in propulsion? Among other reasons may be named, 1st, custom and prejudice, which, on the Western waters, require a high pressure of steam to be maintained; otherwise, the boat is not considered either fast or powerful. 2nd, the absurd notion existing among a large class of their engineers, that steam has a momentum or impact, which, at high pressures, imparts a force to the piston over and above that due to its pressure, when considered as a compressed and elastic vapour. 3rd, and most probably the principle reason, a contraction in the steam openings and pipes, which increases the friction due to the passage of steam at such high pressure, and diminishes the velocity at which it can be supplied to the cylinders;—thus rendering necessary a great difference between the boiler and cylinder pressure.

If these reasons are just, the remedies are quite as plain, and need not be enlarged upon. It is easy to increase the area of passages, and ensure a liberal supply of steam to the cylinders, even though such augmentation be attended with increased expense; and expense should be no object, when viewed as a certain means of obviating the necessity for carrying this dangerous pressure of steam. Then legislative enactment must lend its aid to compel engineers to work their boilers at the minimum pressure, which, with wide throttles, will be found as efficient as the present system.

There is, therefore, no doubt that a much lower pressure of steam might, with the same engines, perform all that is done by the exalted pressure now carried so universally; while, at the same time, the comfort, economy, and, above all, the safety of the boats, would be vastly increased.

But there is another means of overcoming the difficulty, and of increasing the economy of these packets, viz., the employment of condensing engines, which would at once cut down the requisite initial pressure 12 to 14 lbs. per square inch, and, by lessening the work of the boilers, permit a more perfect combustion of fuel. And, although prejudice has done its utmost to prevent, or rather to postpone, in that section of the country, this improvement, high-pressure engines will as certainly be driven from the Western rivers, at some future day, as they have been from the lakes within the past few years. Their use on Lake Erie, which was formerly the rule, forms now a bare exception.—[*Franklin Jour.*]

EARLY EGYPTIAN CHEMISTRY.

We would call attention to the following interesting communications to the Philosophical Journal, which, apart from the information they contain respecting the balance of probabilities therein discussed, derive a value from the fact that they perfectly illustrate the tendency of the philosophic mind of the present age to overlook no matter that will, in the region of probability, tend to solve difficulties which have hitherto baffled the exertions of the ingenious. Without offering any opinion on the subject under discussion, we leave our contemporary's correspondents to speak for themselves.

To the Editors of the Philosophical Magazine and Journal.

Gentlemen,

While engaged in unrolling a mummy at the Bristol Philosophical Institution lately, I elicited a few chemical facts which might probably be interesting to some of your readers. On three of the bandages were hieroglyphical characters of a dark colour, as well defined as if written with a modern pen; and where the marking fluid had flowed more copiously than the characters required, the texture of the cloth had become decomposed and small holes had resulted. I have no doubt that the bandages were genuine, and had not been disturbed or unfolded: the colour of the marks were so similar to those of the present "marking-ink," that I was induced to try if they were produced by silver. With the blowpipe I immediately obtained a button of that metal; the fibre of the linen I proved by the microscope, and by chemical re-agents, to be linen; it is therefore certain that the ancient Egyptians were acquainted with the means of dissolving silver, and of applying it as a permanent ink; but what was their solvent? I know of none that would act on the metal and decompose flax fibre but nitric acid, which we have been told was unknown until discovered by the alchemists in the thirteenth century, which was about 2200 years after the date of this mummy, according as its superscription was read. A very probable speculation might be raised upon this to account for the solution of the golden calf by Moses, who had all his mundane knowledge from the Egyptian priests. It has been supposed that he was acquainted with and used the sulphuret of potassium for that purpose: how the inference arose I know not; but if the Egyptians obtained nitric acid, it could only have been by the means of sulphuric acid, through the agency of which, and by the same kind of process, they could have separated hydrochloric acids from common salt: it is therefore more probable that the priests had taught Moses the use of the mixed nitric and hydrochloric acids with which he could dissolve the statue, rather than a sulphuret, which we have no evidence of their being acquainted with.

The yellow colour of the fine linen cloths which had not been stained by the embalming materials, I found to be the natural

colouring matter of the flax; they therefore did not, if we judge from this specimen, practise bleaching. There were in some of the bandages near the selvage some twenty or thirty blue threads; these were dyed by indigo, but the tint was not so deep nor so equal as the work of the modern dyers;—the colour had been given it in the skein.

One of the outer bandages was of a reddish colour, which dye I found to be vegetable, but could not individualize it: my son, Mr. Thornton J. Herapath, analyzed it for tin and alumina, but could not find any.

The face and internal surfaces of the orbits had been painted white, which pigment I ascertained to be finely-powdered chalk.

I am, Gentlemen,

Yours respectfully,

WILLIAM HERAPATH.

Mansion House, Old Park,
Bristol, June 10, 1852.

GENTLEMEN,

Permit me to occupy a small space in your journal with a few observations on Mr. Herapath's paper with the above title, published in your supplement number for July.

Mr. Herapath's fact of a solution of silver having been used some three thousand years since as "marking-ink," is in every way interesting, being excellent additional evidence of the familiarity of the ancient Egyptians with a somewhat advanced stage of the chemical arts; but dissenting as I do from all the deductions Mr. Herapath has arrived at from this fact, and thinking it probable that they may take deep root and become widely spread as received opinions, if unremarked upon, I have ventured to allege a few reasons in refutation of the inferences of your correspondent.

The first conclusion necessarily involved in the views of Mr. Herapath is, that the ancient Egyptians must have been acquainted with nitric acid; the second is, that they were familiar with the use of sulphuric and hydrochloric acids; the third, that the Great Lawgiver travelled with what must be considered a well-appointed laboratory, or, which is still less probable, was able to construct an impromptu one (both materials and apparatus) in the Desert; and the fourth, that the golden calf was dissolved in *aqua regia;* all of which conclusions are founded and built up on the single fact of the existence on mummy linen of marks which must have been produced by a solution of silver.

To the two first (the third I need not notice), I would object that there is no nation of antiquity, with whose every-day existence, their manners, customs, and arts, we are so well acquainted as with those of the ancient Egyptians; and that, whilst we have abundant evidence of their familiar and skilful practice of many metallurgic arts, there is no representation nor evidence whatever—I speak under correction—of their acquaintance with the art of distillation; and I hold that, in this instance, the absence

of such evidence amounts to a *primâ facie* proof that they were ignorant of it. How these acids were to be obtained without distillation, Mr. Herapath does not inform us. I have here taken the most favorable supposition, that the presumed Egyptian sulphuric acid was obtained by distillation, like the Nordhausen acid, rather than by any complicated processes similar to those employed in the present day.

Again, if it can be shewn that the Egyptians of those times were acquainted with substances capable of producing a solution of silver, it is surely advisable to pause before adopting a theory involving the employment of various materials and several complicated processes, of which, excepting silver and common salt, there is no evidence whatever they knew of, and take Horace's counsel—

> "Never presume to make a god appear,
> But for a business worthy of a god."

With silver, and consequently with its ores, with common salt, and with lime, it will at once be admitted that this nation was familiar; and although it is probably incapable of proof, that ammonia was known to them, yet if we consider that sal-ammoniac was for ages derived exclusively from Egypt,—being procured from the soot of camel's dung used as fuel, a necessity, and, consequently, a practice, which must have existed in the Mosaic epoch as well as now, since no other fuel is procurable in the Desert, together with the unchangeableness of eastern habits, and the fact that this salt was known to the writer of the earliest authentic chemical treatise extant, it is scarcely assuming too much to believe that sal-ammoniac was employed in the arts in ancient Egypt; and with these four substances, as every chemist knows, a solution of silver may readily be procured without the intervention of nitric, or indeed of any acid whatever; which solution is decomposed by exposure to air and light, particularly if in contact with an organic body, with the production of dark purple-black stains. It must not be supposed, because an argentine solution might have been procured in this way at the period we are considering, that I therefore hold such must have been the solution employed in Egypt; but that I merely suggest it as more probable and consistent with existing evidence than the wholly gratuitous supposition that the marking-ink of ancient Egypt had nitrate of silver for its basis.

How the notion first arose, that the Israelitish idol was dissolved, I cannot comprehend, save that the text was never read by a "solutionist," seeing that it is directly opposed to the plain meaning of the sacred narative, which tells its tale in as clear, simple, and concise language, as could be employed in the present day, were we desirous of relating the same facts in the most condensed form. These are the words:—"And he took the calf which they had made, and burnt it in the fire, and ground it to powder, and strawed it upon the water, and made the children of Israel to drink of it." (Exodus, xxxii. 20.) The other version of the translation closely resembles the foregoing:—"And I took

your sin, the calf which ye had made, and burnt it with fire, and stamped it, and ground it very small, even until it was as small as dust; and I cast the dust thereof into the brook that descended out of the mount." (Deuter. ix. 21.) Can anything be more evident than that the golden calf was reduced to an impalpable powder, and thus rendered potable when mixed with water? Yet Mr. Herapath, like many before him, writes,—"A probable speculation might be raised upon this" (the assumed knowledge of the uses of nitric acid by the Egyptians) "to account for the solution of the golden calf by Moses;" and then, after destroying the chimera of the solution of the calf in sulphuret of potassium, tumbles himself into this Charybdis,—"It is therefore more probable that the priests had taught Moses the use of the mixed nitric and hydrochloric acids with which he could dissolve the statue, rather than a sulphuret, which we have no evidence of their being acquainted with," an observation which I have endeavoured to shew is equally applicable to these two acids.

If it be asked, How did Moses grind this malleable idol "as fine as dust?" the answer seems to me very easy; in the words of the text, "he burnt it with fire;" that is, he fused and alloyed it with a substance capable of rendering gold brittle. What this was I pretend not to say, but many bodies possess this property; it might have been arsenic, more probably antimony, but still more probably it was lead; I say, still more probably, as, although we know the antiquity of the use of sulphuret of antimony for painting the eyes and eyebrows in the east, yet I am unaware of any positive evidence that it was known to the ancient Egyptians; whilst with regard to lead, we have both material evidence and written testimony:—"Only the gold, and the silver, the brass, the iron, the tin, and the lead" (Numbers xxxi. 12),—that lead was then a common metal; whilst with respect to the properties of this alloy, L. Gmelin, vi. p. 245 (Cavendish Soc.), thus describes an "alloy of gold and lead:—11 parts of gold and 1 part of lead form a pale yellow alloy, as brittle as glass. The ductility of gold is destroyed by admixture of $\frac{1}{1920}$ of lead." Now without presuming to say that lead was actually the material used by Moses to render the golden calf so brittle as to enable him to grind it "as fine as dust," yet I would submit, as this metal completely fulfils every condition required by the history, and as dokimasy was then sufficiently advanced to allow of such an alloy being made, that it assumes a very high degree of probability, being in complete and exact accordance both with the sacred narrative and also with the ascertained state of the metallurgic art at the time, that the golden calf was alloyed with lead; that this brittle alloy, when stamped and ground as fine as dust, was "strawed" on the water from the mount, of which the Israelites drank, and that a solution of the idol was neither effected nor even thought of.

I am Gentlemen, yours, &c.,

Putney, July 19th, 1852. J. DENHAM SMITH.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

(*Continued from page* 152.)

A paper, by Mr. DANIEL K. CLARK, of Edinburgh, "*On the expansive working of steam in locomotive engines*," was read,—being a continuation of his former paper, read before the last meeting.*

In this paper it is proposed to consider the conditions on which the expansive working of steam in locomotives may be most beneficially carried out.

The condensation of steam in the cylinder by exposure, which takes place in certain arrangements of locomotives, is susceptible of proof in various ways: viz., by the internal evidence of the indicator-diagram, in respect of its general form, the form and course of the expansion-line, and the back pressure; also, by a comparison of the volume of sensible steam which is found to pass through the cylinder, with the volume of water found, by measurement, to be consumed from the tender and the boiler.

Of the evidence of the expansion-line of the indicator-diagram.—By Regnault's experiments it is proved that the total heat of saturated steam increases slightly with the pressure, at such a rate that for atmospheric steam it is 1179° Fahr., and for 100 lbs. of steam it is 1217°, or 38° more. This difference is of little importance, except as it shews that when steam of higher pressure is expanded, and falls to a lower pressure, it becomes slightly surcharged with heat as it expands—assuming that it does not part with any of its heat, and that there is, at least, no necessary condensation of steam during expansion, and that in fact there cannot be any, except what arises from the abstraction of the heat of the steam by external causes.

If water be present with the steam in the cylinder during expansion, as there commonly is, the heat of surcharge would convert a part of this water into steam. If 100 lbs. steam be expanded down to 20 or 30 lbs., the accession of steam in this way would be about $\frac{1}{40}$th of what is originally admitted; although the difference is so small, even for so prolonged an expansion, as not to require further consideration in the present enquiry.

The slow diagrams from No. 13 Caledonian railway engine, fig. 1, Plate V., supply examples of the results of condensation, and its influence in modifying the expansion-line. If the steam, which is cut off, be permitted to expand in the cylinder without any abstraction of its own heat, there can be no alteration of the whole quantity or mass of steam, whatever the change of volume may be; and the quantity of steam virtually saturated, indicated at the end of the expansion, or at any intermediate stage, should

* See page 63, *ante*.

be found the same as at the commencement. If it be either greater or less, some change, by condensation or otherwise, must have taken place in the condition of the expanding steam. Referring to the diagrams from No. 13, (for which the points of distribution of the steam have already been given in the first paper)—it was stated, that if the whole clearance at the end of the cylinder, including the port, measured by 1¼ inches of stroke, be added to the volumes of the steam at the beginning and end of the expansion, the sums so found will be measures of the total initial and final volumes of the steam expanded; and the ratios of these volumes for each notch are contained in the 2nd column of the following table. The observed initial and final sensible pressures are added in columns 3 and 4. Dividing, in each case, the total volume of the steam (equal to the product of the area of the piston and the length of stroke representing the volume) by the relative volume due to the pressure, the quotient is the water-equivalent, or the volume of water at 60° from which the steam is formed. The initial and final water-equivalents for each notch are entered in cols. 5 and 6, and their differences in col. 7, distinguished as positive (+) if in excess of the initial quantity, and as negative (−) if in deficiency;—the 8th col. contains the values of these differences as per-centages of the initial equivalents. In col. 9 are the pressures with which the expansion would have terminated, had the initial quantity of steam, in each case, been preserved intact throughout the expansion: these pressures are found, in each case, by multiplying the relative volume of steam, of the initial pressure, by the ratio in col. 2, which gives the relative volume of the final body of steam, and, consequently, its pressure. Col. 10 contains the differences of the final pressures so calculated, and those actually observed, col. 4.

TABLE A.—*Of the expansion and water-equivalents of steam in the cylinder of No. 13, C. R.*

No. of Notch.	Ratio of Total Initial and Final Volumes.	Observed Pressures.		Water-Equivalents.				Final Pressure due to an equal Final Equivalent	Difference of Final Pressures in Cols. 4 and 9.
		Initial	Final.	Initial	Final.	Difference of Initial and Final.			
	Ratio.	lbs.	lbs.	Cubic Ins.	Cubic Ins.	Cubic Ins.	Per Cent. of Initial.	lbs.	lbs.
1	1 to 1·34	38	22	4·73	4·56	−·17	−3½	23½	+1½
2	1 to 1·58	41	19	3·99	4·01	+·02	+ ½	19	0
3	1 to 1·95	38	16	2·74	3·26	+·52	+19	10½	−5½
4	1 to 2·66	39	13	1·58	2·29	+·71	+45	4	−9
1	2	3	4	5	6	7	8	9	10

By tracing expansion-curves on the diagrams of No. 13, with the final pressures in col. 9, and otherwise such as would have been described with a constant quantity of saturated steam under expansion, the deviations of the actual curves from these, as standards, are easily shewn. For No. 1 diagram, fig. 1, Plate V., the new dotted curve CD lies, for its whole length, above the actual, and terminates at 1½ lbs. more. For No. 2, the curves nearly coincide; for No. 3, the new curve proceeds for some distance above the actual, then crosses and falls lower as it advances, until it ends at 5¼ lbs. below the other; for No. 4, the new curve AB passes on as in No. 3, and ends at 9 lbs. below the actual. These deviations are all referable to one cause—the condensation of the steam.

In No. 1, the cylinder must have been at a lower temperature than the steam during the admission, and some condensation must have taken place; for no sooner is the steam cut off, than condensation is made visible by the sinking of the expansion-curve below the standard throughout the whole of its length. In No. 2, also, this takes place, to a small extent, for the first half of the curve, when the temperatures of the steam and the material of the cylinder become equal; after this, as the pressure continues to fall, and the temperature of the steam with it, the curve rises and meets the standard curve at the end, in virtue of a partial re-evaporation of the steam previously precipitated, caused by the cylinder itself, which, colder than the steam, and heated by it in the first stage of the expansion, is now relatively hotter, and partially restores the heat of which it had previously robbed the steam.

In Nos. 3 and 4, the process of successive condensation and re-evaporation is still more distinctly brought out. In these cases, the greater portion of the heat, engaged in the restoration of the steam during expansion, must have been absorbed by the cylinder, by condensation of the steam during admission. A reference to cols. 7 and 8 shews the magnitude of this condensing agency; for under the 3rd and 4th notches, the observed final equivalents are shewn to exceed the initial by 19 and 45 per cent. of the latter respectively: which proves that, in the two cases, at least 19 and 45 per cent. of the steam admitted must have been condensed during admission; as the additional steam can have been obtained from no other source. Although the actual expansion-curves, Nos. 3 and 4, indicate much higher mean pressures, during expansion, than the standard curves, and may so far be viewed as superior results, the favorable difference is only a partial amends for the much greater loss by initial condensation; and an expansion-curve may be constructed backwards, in terms of the indicated mass of steam at the end of the expansion, to shew from what initial pressure this mass of steam could have expanded, had there been no condensation. Take No. 4, for example. The final pressure at E is 13 lbs., for which the relative

volume is 939, and the ratio of the initial and final total volumes, or the degree of expansion, is 1 to 2·66; then 939 ÷ 2·66 = 353, which is the relative volume for 66½ lbs. steam at the point of suppression. Tracing the expansion curve EF for this pressure (for which any number of intermediate points may be found in the same way), and drawing a horizontal admission-line FG to the beginning of the stroke, the extra shaded area so enclosed is a representation of the real loss incurred by initial condensation of steam; and, without going into figures, it appears nearly as much again as the area or power actually obtained.

The diagrams just discussed are, of course, extreme cases, which might occur in any cylinder, outside or inside; and they have been selected simply for purposes of illustration. They have served to shew in what way the expansion-curves of indicator diagrams may be turned to account in developing the condition of the steam. Our business is now to find to what extent, in the ordinary working of locomotives, the condition of the steam is affected by the circumstances of the cylinder.

It so happens (though not necessarily so), that inside cylinders are, in general, better protected than outside cylinders. The former are more completely within the smoke-box, and are more closely in contact with the smoke, and derive more benefit from its heat, than the latter; though, of course, there are many examples of inside cylinders being, for mechanical reasons, completely excluded from the smoke-box, and having no other advantage over outsides than that they are less exposed to atmospheric drafts. The distinction of outside and inside, occasionally employed in this paper, must be understood to refer, not to constructive arrangements, but to the incidental conditions of exposure and protection.

The stress of the argument will be derived chiefly from the results obtained from the well-protected cylinders of the "Great Britain," Great Western Railway, on the one hand, and the partially-protected cylinders of the Caledonian Railway passenger and goods engines, on the other. The first point is to shew, by the expansion-line, that in well-protected cylinders the steam is not subject to condensation. Referring to a table containing the results exhibited by twenty-six indicator-diagrams from the Great Britain, it appeared, that for each notch the influence of speed on the relation of the initial and final water-eqivalents of the steam expanded was nearly inappreciable. The mean differences constitute,—

For the 1st notch,	3	per cent.	of the	initial	equivalent.
„ 3rd „	5½	„	„	„	
„ 5th „	2¼	„	„	„	

These per-centages are practically nothing; and the virtual constancy of the mass of expanding steam during expansion, shews that for the greatest observed degrees of expansion in the cylinder of the Great Britain, no change in the condition of the steam is

observable, and that there is, consequently, no condensation at all. Experiments made by the writer on some of the engines of the Edinburgh and Glasgow Railway, with inside cylinders, lead to the same conclusion.

Of the numerous diagrams obtained from the outside-cylinder engines of the Caledonian Railway, seventy-six were selected as average samples of diagrams obtained during the regular work of the engines. These have been analyzed; and the mean results range from 9 per cent. deficiency to as much as 67 per cent. excess at the greatest expansion.

It appears that, for the greater ratios of expansion, the final equivalent of the steam is much above the initial; and the greater the ratio the greater is the per-centage of this excess, amounting to 67 per cent., with an expansion of $3\frac{1}{3}$ times. This relation is just what was found for the slow diagrams from No. 13; and there is no doubt the excess of steam, at the termination of the expansion, is due to the same cause, namely,—the condensation of the steam in the cylinder during admission, and during the first part of the expansion, and the subsequent re-evaporation of a portion of the precipitated steam. During the experiments there was at all times ocular demonstration of the existence of water in the cylinder, in the spray which escaped from it through the indicator, and which was given off more abundantly the more expansively the steam was worked.

The most direct test of the amount of loss from condensation of the steam during expansion, appears to be the mode adopted by the writer of comparing the water-equivalents, or the actual weights of the steam present in the cylinder, at the beginning and at the end of the expansion An exact conclusion as to the amount of condensation during expansion cannot be obtained from the loss of area in the indicator-diagram. The dotted line EFG added in Fig. 1, is not the curve that would actually have been described had there been no condensation, but such as might have been described by the quantity of steam which the final pressure, during expansion, proves to have been admitted. The loss by condensation could not have been less than shewn by the shaded area, but was certainly greater in amount; for it appears that a portion of the steam admitted, and sometimes a considerable amount of it, is buried for ever, and is not resuscitated at all at the end of the expansion. This is proved by the great increase of back pressure that takes place when a high degree of expansion is used, from the lower temperature of the cylinder.

Proof of the condensation of steam in outside cylinders, by comparison of the indicated consumption of steam with the measured consumption of water.—Arguments for condensation, based upon the measured consumption of water, must be received with caution; because, in some cases, an excess of water passes off as "priming," without ever being evaporated at all. In the following discussion, care will be taken to avoid this source of error.

For the purpose of testing this comparison, the following experiment was tried by the author on the actual consumption of water by an outside-cylinder express engine, No. 42, for a trip of 105 miles, from Glasgow to Carlisle, on the Caledonian Railway, with a train averaging 6½ carriages,—the time of the trip being 3 hours 22 minutes, including 5 stoppages.

Indicator-diagrams were taken from the cylinder at intervals of one or two miles, and the notch of the expansion gear observed for each diagram, and the points of the line where each change of notch was made: the results are shewn in the accompanying Table.

TABLE B.—*Abstract of the working of the Passenger Engine, No. 42, C.R., with Express Train, August,* 1850. *Cylinder* 15 × 20 *inches, wheel* 6 *feet.*

Stations, Intermediate Distances, and times of Steam on.	Notch under which the Engine was worked.	Miles run under each Notch, with steam on.	Average Indicated Pressures at Cutting-off, under each Notch.
	No.	Miles.	lbs.
(1.)	2	½	47
Glasgow to Motherwell, 16 miles, steam on, 30 minutes.	4	5½	36
	”	5½	50
	”	3	72
Average admission 45 per cent. of stroke.		14½	
(2.)	3	10	69
Motherwell to Carstairs, 15½ miles, steam on, 29½ minutes.	”	2¼	38
	4	2	50
Average admission 54 per cent.		14¼	
(3.)	3	9½	50
Carstairs to Beattock, 34 miles, steam on, 38¼ minutes.	4	11	50
	”	3	58
Average admission 50 per cent.		23½	
	2	½	60
	3	3	60
(4.)	”	1½	30
Beattock to Carlisle, 39½ miles, steam on, 56¼ minutes.	4	12¾	38
	”	2	50
	”	1¾	33
	”	7½	52
Average admission 40 per cent.	5	3¼	30
	”	6½	56
		38¾	

The several points of cutting off, expansion, and compression, were accurately ascertained by means of the slow diagrams; from which were calculated the exact quantities and pressures of sensible steam actually consumed in each interval of the trip, and the water-equivalents for the several quantities of steam present in the cylinder; which, multiplied by the number of strokes of the two cylinders in each interval, gives the total quantity of water efficiently used as steam.

The following final results were thus obtained:—

		Water used as Sensible Steam.	Water Consumed as Measured.	Excess.
1	Glasgow to Motherwell	30·76 ft.	35·82 ft.	5·06 ft. or 14 per cent.
2	Motherwell to Carstairs	43·91 „	48·85 „	4·94 „ or 10 do.
3	Carstairs to Beattock ...	57·28 „	67·74 „	10·46 „ or 15½ do.
4	Beattock to Carlisle ...	62·42 „	79·50 „	17·06 „ or 21½ do.
	Total, Glasgow to Carlisle..	194·37 ft.	231·91 ft.	37·54 ft., or 16¼ per cent.

The examination of the indicator-diagrams in the manner employed before, by comparing the initial and final water-equivalents of the steam, during expansion, shews that at least 13 per cent. of this loss of 16¼ per cent. was due to condensation; and it is probable that no appreciable proportion was due to priming—indeed the least loss is observed to take place with the least degree of expansion, and when the consumption of steam from the boiler is going on at the greatest rate, as we find on referring to the percentages of admission in the first column of Table B; which is the reverse of the effect that would be observed if priming were a material cause.

Experiments made by the writer with other outside-cylinder engines, or imperfectly-protected cylinders, corroborate the above deductions obtained from the performance of No. 42; and they are still further corroborated by his experiments on inside well-protected cylinders, which shew that in ordinary good condition there is no sensible excess of water of any importance actually consumed from the boiler, above what is estimated from the indicated steam passed through the cylinder.

The increased back pressure of exhaust affords additional evidence of the presence of water in the cylinder. The back exhaust pressure is the consequence of the want of facilities for the timely discharge of the exhaust steam from the cylinder; and the impediments to its discharge are much increased by the presence of water amongst the steam, whether due to condensation or to

priming. The presence of water is immediately made apparent by the increase in the back exhaust pressure, shewn by the indicator diagram, as the writer has on many occasions had an opportunity of observing. The effects of priming from foulness of water in the boiler were shewn by two indicator-diagrams, taken from the well-protected cylinders of the "Orion," in which very little, if any, condensation could be detected. Both diagrams were taken at the same speed, but one before, and the other after the boiler was blown off and supplied with clear water; and a comparison shewed 7lbs. back pressure, caused by priming in the former case.

That the total quantity of water from condensation is considerably greater, with the greater degrees of expansion (where a smaller quantity of steam is admitted, and consequently the loss is more seriously felt), was shewn by two diagrams, taken from the outside-cylinder goods engine, No. 127, working at the same speed up and down an incline on the Caledonian Railway;—one diagram cutting off at two-thirds of the stroke, and the other at one-sixth of the stroke. The latter, though it had the advantage of a much earlier exhaust, and only one-fourth of the quantity of steam to discharge, was affected with 10lbs. more back pressure than the former, when working in full gear. This great back pressure was maintained over a continued run of twenty miles, when of course the cylinders had got into their working heat for that degree of expansion; and the inference is, that the steam was loaded with water of condensation (proved also by the expansion curve), which was with difficulty expelled, and only became proportionably less when the degree of expansion was diminished, and, consequently, the mass of steam increased, that was to be cooled within the same superficies of cylinder.

That the total mass of the steam has much to do with the condensation was proved by two diagrams, taken under the same degree of expansion, and at the same speed, but with 75 and 20lbs. steam respectively admitted to the cylinder. In the latter diagram, the back exhaust pressure is 7lbs. greater than in the former, although the total quantity of steam to be discharged was so much less. In the latter case, indeed, there was found to be an excess of 18 per cent. of the whole water used over the indicated steam expended, which was most probably altogether by condensation, as the rate of consumption was so moderate as to preclude any likelihood of priming. Now here is a case where, in the same class of engines, the back exhaust pressure increases as the quantity of steam to be discharged becomes less, notwithstanding that the facility for exhaust increases at the same time. This is clearly a case of water in the cylinder, the quantity of which increases with the degree of expansion; and the water is as clearly a precipitation of steam by condensation. Also, though a full admission of steam at higher pressures may reduce the proportion of condensation, yet whenever expansive working is attempted, by cutting off earlier, the heavy back pressure and the course of the

expansion-line alike shew that no pressure of steam, however high during the admission, can mitigate the evils of condensation in exposed cylinders.

Evidence from the proportions of the valve-gear.—The remarkable inversion, just discussed, of our ordinary experience with well-protected cylinders, where the back pressure rises with the degree of expansion, leads to the necessity for more liberal proportions of valve-gear for outside cylinders, to afford a more free exhaust. The writer has invariably found, that of the three fixed elements affecting the exhaust, namely, the sectional area of steam-port, the inside lead, and the area of blast-orifice (so long as the port is larger than the orifice), it is the orifice alone which in well-protected cylinders rules the amount of exhaust back pressure—the wider the orifice, the less the pressure, in the ratio of the fourth power of the diameter of the orifice, or the square of the area; whereas, in exposed cylinders, the back pressure is ruled both by the orifice and by the inside lead—the greater the orifice, and the greater the inside lead also, the less is the inside pressure. This is an important distinction, because it shews that, as inside lead is equal to the sum of the lap and the outside lead, and is, in fact, regulated by the lap, the lap of the valve is a very important element in the designing of outside cylinders, though practically a matter of indifference in insides. Accordingly, it has been found that in Sharp's inside-cylinder engines, on the Edinburgh and Glasgow Railway, which have only a $\frac{5}{8}$th-inch lap—probably the shortest lap in present practice for a 15-inch cylinder—the exhaust is as perfect as in the Caledonian passenger-engines with $1\frac{1}{2}$-inch lap for the same cylinder. Further, in inside cylinders with clean boilers, it is practically a matter of indifference what amount of wear may have taken place in the valve-gear, so far as concerns the exhaust: in outsides, on the contrary, it is a very important object to maintain the gearing in the highest order, so as to keep up the inside lead; as the wear of the gearing directly reduces the lead, and thereby increases the back pressure. The Caledonian is perhaps the first line in this country on which the special advantage of long nap for outside cylinders was experienced. There need not be any apprehension of reducing the tractive power of an engine by increasing the lap, and thereby shortening the period of admission; because the same admission may be obtained by increasing the lead and the travel of valve in the same ratio with the lap; and, it may be added, this may be simply done in existing link-motions, by extending the link beyond the excentric-rod ends, and thereby increasing the range of the sliding blocks and the maximum travel.

The formidable degree of condensation which accompanies high expansion in partially protected cylinders, accounts for the opinion held by men of experience of the inutility, for economical objects, of cutting off the steam earlier than at half-stroke; for the proved advantage of expansive working in inside cylinders is neutralised in outsides by the condensation.

Conditions on which the expansive working of steam in locomotives may be carried out with efficiency and success.—The first condition is to perfectly protect the cylinders, and to maintain them at a temperature at least as high as that of the steam admitted to them. Simple non-conducting envelopes are not sufficient; external supplies of heat must be employed; and the application of a steam-jacket to the cylinder would be advantageous, when other sources of heat are not readily available. The writer tried an experiment with the "Orion," Edinburgh and Glasgow Railway (which has its cylinders suspended in the smoke-box, like the "Great Britain's"), in which, by the use of partitions, the hot air from the tubes was directed entirely round the cylinders, previously to its emerging by the chimney; but he could not detect the slightest change in the performance of the engine, probably because the hot air was really very little hotter than the steam, and the closer contact made no difference. For cylinders already well protected, more thorough modifications would be required to make a sensible improvement. The steam should also be surcharged, previously to entering the cylinder, by passing over an extensive heating surface, deriving its heat from the atmosphere of the smoke-box, or, if necessary, from a hotter source.

The writer has lately been favored with the results of experiments made by Mr. W. C. Hare, of Stonehouse, Devon, on a small engine, with cylinder $3\frac{1}{2} \times 8$ inch stroke, and a boiler having 9 feet of heating surface. He employed a special coil of 40 feet of half-inch copper tube, having $5\frac{1}{4}$ feet of inside surface, and heated by a circular row of very small gas jets. A small cock was fixed on the top of the boiler, close to the mouth of the steam-pipe, and by occasionally opening it when the engine was working, any priming, or even mere dampness of the steam, could be detected; and thus the experiments could be conducted with the assurance that the results were not affected by priming. When the steam was passed through this surcharging-pipe, and was heated to 400° previously to its entering the cylinder, the consumption of water from the boiler was three gallons per hour; and when the communication with the surcharging-pipe was cut off, and the steam led directly to the cylinder, the water used amounted to six gallons, while doing the same work, and involved a great increase of fuel consumed. To effect the economy here noted, from which something must be allowed for the consumption of gas, it appears that a surcharging surface, equal to fully one-half of the heating surface has been necessary; and it is probable that for locomotives a considerable allowance must be made to produce a very decided change. The results of this experiment shew that very much has yet to be done before the capabilities of the locomotive are fully developed.

As steam has been found so very sensitive to exposure on the one hand, and to surcharging on the other, it would probably be

of advantage to lead the hot smoke round the barrel of the boiler and the fire-box, or the barrel only, previously to its discharge by the chimney. The barrel only would probably be enough to tell with good effect, and the hot air might be led either in a winding flue round the boiler, or, what would be better, led along the entire lower half towards the fire-box, and returned along the entire upper half to the chimney. If all the hot air were found too much, only a part of it might be diverted by partitions, or otherwise, from the upper or lower tubes.

The second condition of successful expansive working in locomotives is, the combination of a sufficiently high boiler-pressure of steam with suitable proportions of cylinder and driving-wheel to admit of highly expansive working, consistent with the required duty of the engine. It is probable that 150 lbs. per inch is about the highest pressure at which it is advisable to work a locomotive, consistent with the fair working and durability of its parts. The maximum pressure being settled, and it being assumed that the same pressure is to be maintained in the cylinder during admission, the degree of expansion to be adopted determines the capacity of the cylinder to develope the necessary average power. Long strokes are not advisable on the score of stability, at least for outside cylinders, and large diameters should rather be adopted; for the same reason, large wheels are preferable.

Thirdly, in the details of the mechanism, the cylinder should be arranged to have the shortest practicable steam-ways; as, for short admissions, a long steam-way deducts very much from the efficiency of the steam. Such an arrangement would be greatly promoted by the introduction of balanced valves, or such as have provision for preventing the steam-pressure on the back of the valve; as, by being balanced, they could, with facility, be made large enough to embrace the whole length of the cylinder. The loads which ordinary valves are forced to carry on their backs are enormous; and though there is certainly no momentum in these loads to contend with, yet the friction of surfaces due to the loads is very great, even at the most moderate computation.

Mr. Crampton thought that enough attention had certainly not been paid to the condensation in the cylinders of locomotives at slow speed;—he did not think it was of so much importance at high speeds. It was also particularly of importance in steamboat engines, where the question had not received so much attention as it deserved. He remembered an experiment which shewed a remarkable effect of condensation:—Four condensing engines, of equal size, were working coupled together in a boat, with the steam cut off at one-quarter of the stroke and expanded; two of the engines were then disconnected, and the other two engines were worked, cutting of at half stroke, using, consequently, the same quantity of steam as the four engines did, cutting off at one-quarter of the stroke; but a greater effect was found to be

produced by the steam than when it was used in the four cylinders. This increase of effect appeared to be entirely due to the greater amount of condensation that took place in the four cylinders than in the two cylinders. There were no steam-jackets, only ordinary clothing on the cylinders. In reply to an inquiry, he said the boilers were working with salt water; but he did not think that would affect the result.

Mr. Clark said he had found that even at the highest speeds in locomotives there was great condensation with high degrees of expansion, except in the case of well-protected inside cylinders.

Mr. Peacock suggested, that part of the effect in the experiment mentioned by Mr. Crampton might have been due to the smaller amount of friction in the two cylinders than in the four cylinders, when giving out the same total amount of power.

Mr. Crampton replied, that a greater effect was found to be produced, after allowance was made for the friction, by taking indicator-diagrams, and the relative consumption of the water.

Mr. Whytehead thought the loss by back pressure would also be less in the case of the two cylinders than with the four.

Mr. E. A. Cowper exhibited an indicator-diagram, which he had obtained from a 35-horse-power stationary engine, cutting off at about ¼-stroke, and working expansively, on which he had drawn the true expansion curve, according to Pambour: the difference between the actual and the theoretical curve was a confirmation of Mr. Clark's observations,—the actual curve having fallen below the theoretical at the commencement, and gradually risen a little above it at the latter part of the expansion, from the temperature of the cylinder being higher at that time than the steam. The engine had an uncovered cylinder without a steam-jacket, but was not exposed to the cooling action of passing rapidly through the air like a locomotive cylinder. He observed, that Mr. Stephenson had mentioned, at the last meeting, an experiment by Mr. Trevithick, in which he had found that one bushel of coal, burnt under the cylinder, did as much duty as five bushels of coal burnt under the boiler,—shewing the economy of keeping the cylinder warm.

The following paper, by Mr. Charles W. Siemens, of London, was then read:—"*On the expansion of isolated steam, and the total heat of steam.*"

The object of this paper is to lay before the members the results of certain experiments on steam, purporting, in the first place, to corroborate Regnault's disproval of Watt's law,—"that the sum of latent and sensible heat in steam of various pressures is the same;" in the second place, to prove the rate of expansion by heat of isolated steam; and, in the third place, to illustrate the immediate practical results of those experiments in working steam-engines expansively.

The amount of heat required to convert one pound of water into steam of different pressures has occupied the attention of natural philosophers from the earliest periods of the modern steam-engine. Dr. Black observed, about a century ago, that a large quantity of heat was absorbed by water in its conversion into steam (not accompanied by an increase of temperature), which he termed "the latent heat of steam." His apparatus consisted simply of a metallic vessel containing water, which he exposed to a very regular fire; and from the comparative time which was occupied, first in raising the temperature of the water to the boiling point, and, secondly, in effecting the evaporation, he approximately determined the amount of latent heat. Resuming the experiment, in conjunction with Dr. Irvine, he employed a different apparatus, consisting of a steam generator, and of a surface condenser, or a serpentine tube, surrounded by a large body of cold water. The steam which condensed in the serpentine tube was carefully collected and weighed, and the rise of temperature of the surrounding water was observed, which, multiplied by its known quantity, represented the total quantity of heat which the steam had yielded.

The quantity of heat requisite to raise the temperature of one pound of water through 1° Fahr., being taken for the unit of heat, Black and Irvine obtained for the total quantity of heat in

Steam of atmospheric pressure, the number ..	954
Southern	1021
Watt	1140
Regnault............................	1145
Dr. Ure	1147
Desprer, 1136, but later..................	1152
Brix................................	1152
Guy Lussac and Clement	1170
Count Rumford	1206

All of these eminent experimentalists employed essentially the same apparatus; and the differences between their results proves its great liability to error. Brix, of Berlin, was the first to investigate those errors, and to calculate approximately their effect upon the results obtained.

While such a large amount of labor and talent has been expended, to determine the latent heat in steam of atmospheric pressure, a far more important question seems to have been passed over with neglect, namely—What is the relative amount of heat in steam of various densities? Watt justly perceived the importance of this question, but contented himself with one experiment, upon which he based his law, "that the sum of latent and sensible heat in steam is the same under all pressures." Southern repeated the experiment, and found that steam of greater density contained absolutely more heat than steam of lower pressure, which induced him to adopt the hypothesis that "the latent heat of steam was the same at all pressures."

Subsequent experiments and general reasoning seemed to be in favor of Watt's law, which enjoyed general confidence until it was attacked, only a few years since, by Regnault, of Paris, who proved, by a series of exceedingly elaborate and carefully conducted experiments, that neither the law of Watt nor that of Southern was correct, but that the truth lay between the two. The apparatus employed by M. Regnault may be said to be a refinement upon those previously employed, and with the advantage of Brix's labours, to determine the amount of errors, he seems to have succeeded in measuring the absolute amount of heat in steam of various pressures with surprising accuracy. The costly and complicated nature of the apparatus employed by M. Regnault, has hitherto prevented other experimentalists from repeating the experiment; and, in the mean time, practical engineers still continue to adhere to Watt's law.

Shortly after the publication of Regnault's experiments by the Cavendish Society, in 1848, the idea occurred to the author of the present paper that their results might be brought to a positive test by a simple apparatus, which he exhibited to the meeting in operation. It consists of an upright cylindrical vessel of tin-plate, surrounded by an outer vessel, filled with charcoal, or other non-conducting material. A steam-pipe, with a contracted glass vein or nozzle, enters the upper part of the inner vessel, in a position inclining upwards, in order that the water of priming from the boiler, and of condensation within the pipe, may return to the former, allowing only a small jet of pure steam to enter the vessel, where it suddenly expands and communicates its temperature to the bulb of a thermometer, which is inserted through a stuffing-box from above. The lower extremity of the inner vessel is connected on the one hand to a mercury gauge, and on the other to a condenser, by means of a stop-cock to regulate the pressure. The pressure and temperature of the steam within the boiler being known, and the temperature of the expanded steam observed, it will be seen whether that temperature coincides with the temperature which is due to pressure indicated by the mercury gauge. If it did, then Watt's law would be confirmed; but since the temperature rises higher than is due to the pressure, it follows that the high-pressure steam contains an excess of heat, which serves to *super-heat* the expanded steam. All losses of heat from the apparatus would tend to reduce the temperature, and be in favor of Watt's law; but it will be shewn that those losses may be entirely eliminated, and a true quantitative result be obtained. For this purpose, the pressure in the boiler should first be raised to its highest point, and the indicating apparatus be well penetrated by the heat: the fire under the boiler should thereupon be reduced, and observations made simultaneously, and at regular intervals, of the declining pressure within the boiler, and temperature of the expanded steam of constant pressure. The pressures being nearly equal, the fire under the boiler

is again increased, and the observations continued until the maximum pressure is once more obtained; and the loss of heat by radiation, &c., may be correctly estimated, by a comparison of the two series of observations.

The second portion of this paper relates to the rate of expansion of isolated steam by heat, that is, steam isolated from the water from which it is generated.

The author has not been able to meet with any direct experiments on this subject, except some at a recent period by Mr. Frost, of America, which, however, do not seem entitled to much confidence. The rate of expansion of air and other permanent gases by heat was first ascertained by Dalton and Guy Lussac simultaneously, who determined that all gases expanded uniformly, and at the same absolute rate, amounting to an increase of bulk equal to $\frac{1}{480}$th part of the total bulk at 32° Fahr. for every degree Fahr., or $\frac{1}{660}$th part of the total bulk at 212°. Dulong and Petit confirmed the law of Dalton and Guy Lussac; but it appears that these philosophers confined their labours to the permanent gases and atmospheric pressure, and merely supposed the general applicability of their discovery.

Being interested in the application of "super-heated" steam, the author tried some direct experiments on its rate of expansion, in the year 1847, which confirmed his view, that vapours expand more rapidly than permanent gases; or, in other words, that the rate of expansion of different gases and vapours is equal, not at the same absolute temperature, but at points equally removed from their point of generation.

The apparatus employed in these experiments consists of a metallic trough, containing oil, which is placed upon a furnace, heated by the flame of gas. One end of the trough is provided with a stuffing-box, through which a glass tube, of about $\frac{1}{16}$th inch diameter, and sealed at one end, may be slipped, and will rest horizontally upon a scale below the surface of the oil. The mouth of the glass tube is connected to an open mercury syphon, with either the one or the other leg filled with mercury, to produce the desired pressure within the horizontal glass tube. A small drop of water and a piston of mercury being introduced into the bottom of the tube, it is placed in the oil bath, and connected to the syphon. The oil bath is then gradually heated, and the temperature observed. As soon as the boiling point of water under the pressure in question is reached, the mercury piston will move rapidly forward, until all the water is converted into steam. The temperature continuing to increase, the piston will continue its course more slowly upon the scale, where its progress is noted from time to time, together with the temperature. The experiment is continued until the temperature reaches about 400°, when the oil begins to boil: the gas flame is then withdrawn, and the bath allowed to cool gradually. The observations of the temperature and the position of the mercury piston are continued until the

steam contained behind it is recondensed. A comparison between the two series of observations gives the correct mean of the experiment, by which the effects of the friction of the mercury piston, any possible slight leakage of steam past it, and faults consequent on the slow transmission of heat, are completely neutralized.

The curve A, on the diagram, fig. 2, Plate V., has been drawn, expressing the rate of expansion of atmospheric steam according to these experiments. The results of nine separate experiments very nearly coincide (as shewn by the dotted lines, which give the extreme variation in the experiments), except at the starting point, where the rate of expansion is so very great, that it is difficult to obtain correct observations: changes in the barometer, moreover, affect the curve in the vicinity of the boiling point. To obviate the effect of these inaccuracies, the unit of volume in laying down the curves from each of the nine experiments was taken, not at the absolute boiling point, but at 250°, where the expansion had already assumed a definite course.

The diagram also shews a straight line B, expressing the rate of expansion of common air, which at first diverges greatly from the hyperbolic curve of expansion of steam, although the asymptote of the latter seems to run parallel to the former. The author considers it therefore highly probable, "that the rate of expansion of all gases may be expressed by one hyperbola, which starts from the condensing point of the gas," and that the apparently uniform rate of expansion of the permanent gases may be accounted for by their great elevation, at the ordinary temperature, above their supposed boiling point, in consequence whereof the true curve approaches so nearly to its asymptote that the difference cannot be detected by experiments.

The general result obtained from the above experiments may be stated as follows:—That steam generated at 212°, and maintained at a constant pressure of one atmosphere, when heated out of contact with water to

230°	is expanded	5	times more than air	would be.
240°	ditto	4	ditto	ditto
260°	ditto	3	ditto	ditto
370°	ditto	2	ditto	ditto

The author intends to extend the range of his experiments upon gases and vapours under high pressure, and will communicate the further results to the Institution.

The diagram contains another curve C, shewing the results of Mr. Frost's experiments (alluded to before), which, from the very sudden and irregular rise at the commencement, appears to be affected by some serious source of error.

The two curves of pressure and density P, and D, shew the rate at which saturated steam increases in pressure and in density with the rise of temperature marked at the bottom of the diagram. It will be observed that the pressure increases at a rather greater rate than the density; and it is a remarkable circumstance, that

the difference, or the rate at which the pressure increases faster than the density (which is in effect the rate of expansion of saturated steam with the increase of sensible temperature), exactly coincides with the line B, representing the rate of expansion of atmospheric air.

It has been theoretically demonstrated that a perfect Boulton and Watt condensing engine (abstracting friction and all losses of heat in the furnace and through radiation) would only yield about seven per cent. of the mechanical force, which would be equivalent to the expanded heat. It may be argued from this, that the steam-engine is destined to undergo another great modification in principle; and, in the author's humble opinion, this crisis will be accelerated by inquiries into those properties of gaseous fluids which have hitherto excited but little attention, and especially into the properties of dry steam, or isolated steam.

The present paper will be confined to shewing the effect of the above experiments upon the rate of expansion of steam within the steam-cylinder of an engine. It was demonstrated by the first-named experiments, that expanded steam is super-heated steam; and, by the second, it is shewn what is the expansion of bulk due to an increase of temperature. Supposing the results of the experiments to be correct, the expansion curve as laid down by Pambour, and which is based upon Watt's law, requires a modification due to the excess of temperature in expanding steam; and it will be observed, that this correction in the curve of expansion is in favor of working engines expansively; as a greater average pressure is obtained during expansion than would be the case if the expanded steam were not thus super-heated. Its correctness is corroborated by some actual observations by Mr. Edward A. Cowper in taking diagrams of expansive engines, previous to his acquaintance with the above experiments. It moreover appears, that in Cornwall engineers have been practically acquainted with the fact, that expanded steam is super-heated steam, and more economic in its use than saturated steam; for it is a practice with them to generate the steam at very high pressure, and to expand it down to the required pressure previous to its reaching the steam-cylinder. Another remarkable practical observation is, that a jet of high-pressure steam does not scald the naked hand, while a jet of low-pressure steam does, although the high-pressure steam is the hotter substance. The cooling effect of a jet of high-pressure steam is so powerful, that, as the author has been informed, ice has been actually produced in the heat of summer in America, by blowing a powerful jet of steam of 400 lbs. pressure per square inch against a damp cloth. This phenomenon may be explained by the perfectly dry and under-saturated state of expanded steam, which, with a strong tendency to re-saturate itself, produces a powerful evaporation on moist surfaces with which it comes in contact. The rapid rate of expansion of steam by heat, when still near its boiling point, proves the economy of

heating the steam-cylinder, either by a steam-jacket, or by the application of fire. It is, however, important to observe, that the specific heat of steam seems to diminish, the more the temperature exceeds the boiling point.

Mr. Crampton enquired whether the charcoal in the casing of the instrument would not get heated by the tube of high-pressure steam passing through it during the experiment, and so superheat the steam in the internal cylinder?

Mr. Siemens explained, that it was not possible for such an effect to take place, as the end of the steam-pipe was exceedingly small, and was protected by a thick non-conducting casing. He had also observed several times during the experiments, that whenever any priming took place in the boiler, and a drop of water came out with the steam and fell on the bulb of the internal thermometer, the mercury fell immediately to 212°, or the boiling point of water, and remained steadily there for four or five minutes, until the whole of the priming water was converted into steam, when the mercury again gradually rose to its former temperature. This shewed that the increased temperature above 212° in the internal cylinder was entirely due to the extra heat in the expanded high-pressure steam, and not to any heat derived from the charcoal casing.

Mr. E. A. Cowper observed, that the only source of heat to raise the temperature of the charcoal casing, was the super-heat in the expanded steam in the interior of the cylinder; as the jet of high-pressure steam was so small and well protected, that it could not have any appreciable effect in heating the charcoal: consequently, the charcoal casing could only attain the temperature of the expanded steam that was passing through it, and could not influence the temperature of that steam. In the first experiments tried by Mr. Siemens and himself, the lower end of the cylinder was entirely open to the atmosphere, so as to try the experiment with steam expanded down to the atmospheric pressure; and as the expanded steam was passing out into the atmosphere in a constant stream from the open mouth of the cylinder, it was impossible there that the increased temperature maintained in the cylinder could have been affected by the charcoal casing, and it could only have been due to the extra heat contained in the high-pressure steam.

Mr. Siemens said, that as a check on the accuracy of the observations, he had tried them successively in an ascending and a descending series, when any error from the source alluded to would have been made apparent and been doubled in effect; but he could not detect more than one degree difference in the observations.

Scientific Adjudication.

LIVERPOOL ASSIZES.

Nisi Prius Court.—*Before Mr. Justice Wightman.*

BREFFIT *v.* WINTERBOTTOM.

This was an action for the alleged infringement, by the defendant, Mr. James Winterbottom, a glass bottle manufacturer at Castleford, of a patent granted to Alexander Southwood Stocker, on the 28th May, 1846, for "improvements in the manufacture of bottles, and other similar vessels; also in stopping or covering the same; and in the manufacture and application of the whole or part of the articles to be used;" which patent had been assigned to the plaintiff Mr. Edgar Breffit, formerly a partner of the defendant. The pleas put on the record by the defendant were,—a denial of the infringement; that Stocker was not the true and first inventor; that the invention was not new; that the specification was insufficient; and that the invention was not a new manufacture.

The Attorney-General for the County Palatine, Mr. Serjeant Wilkins, and Mr. Hindmarch, appeared in support of the plaintiff's case; and Mr. Watson, Q.C., Mr. Hugh Hill, Q.C., and Mr. Webster, were for the defendant.

The Attorney-General, in opening the case, said that the invention in question was intended to meet the objections which existed against cork-bungs, and to provide a cheap and efficient substitute therefor. To effect this, the patentee formed, in the neck of his bottles, an annular recess, to receive a ring of cork, or other elastic substance, which rested upon the shoulder of the recess, and was thereby prevented from falling into the body of the vessel. Into this ring, a plug or stopper, provided with a cap, was thrust; and thus a perfect air and water-tight stopping was effected. The invention also referred to a mode of securing the stopper in its place; and, for this purpose, a nick or groove was made in the head or cap of the stopper, and nicks corresponding thereto were formed on the lip of the bottle-neck, at opposite sides thereof, to receive the twine, wire, or other material, by which corks are usually held down in their place. It was not contended that the defendant had imitated the improved bottle which constituted the first part of the plaintiff's invention; but that he had pirated the stopper, which consisted of a rigid core, surrounded by an elastic substance; and that he had obtained the same end as the plaintiff, by forming an annular recess in the stopper,—the shoulder of which recess acted in precisely the same manner as the shoulder in the neck of the plaintiff's bottle, and retained the ring of cork, or other elastic substance, in its place. Witnesses having been called to prove the sale of the defendant's stoppers, it was elicited, on cross examination, from

one of these witnesses (Mr. Winterbottom, jun., the defendant's son), that nicks or grooves had been commonly made in glass stoppers long before the date of Stocker's patent. In support of the case, Mr. Charles May (late of the firm of Ransom and May, engineers) was called. He stated, that he had been brought up a chemist, and was therefore familiar with the bottle trade. He believed that a nick in the stopper, coincident with nicks made in the lip of a bottle, was new at the date of the patent. So far as the annular recess was concerned, there had been such before, but not combined with the nicks for receiving the twine or wire. The novelty of the stopper consisted in surrounding a hard or inelastic substance with an elastic substance. When the stopper is applied to the bottle, the elastic substance receives a lateral pressure. The annular recess, to which he referred, was described in Betts and Stocker's patent, dated Dec. 30th, 1844. This was a shallow recess, to receive a disc, which was retained in its place by a metal capsule. The pressure, in this instance, was vertical; and the edge of the disc need not fit against the inner periphery of the bottle-neck, to render the stopper water-tight. The plaintiff's stopper might be used with a common bottle, but not with the same advantage as with bottles having an annular recess. On cross examination, the witness stated, that the nicks in the lip of the plaintiff's bottle were new; but that the annular recess of Betts', as exhibited in a glass bottle handed to witness, was similar to that of the plaintiff's. When removing the plaintiff's stopper from the bottle, the rigid core comes out without the ring of cork, which is left bearing against the shoulder of the annular recess. He had, previous to 1846, seen rings of cork introduced into necks of bottles a thousand times in chemical experiments. [A glass receiver, having a conical neck, fitted with a ring of cork, was handed to the witness.] The vessel exhibited, he admitted, was of the ordinary construction, and that the form of its neck prevented the ring of cork from being thrust into the body of the vessel; but rings of cork, when applied to such vessels, were not intended for stopping, but merely to sustain the connecting tube which was thrust into them. A free escape of air from the receiver to the atmosphere was permitted, and therefore this ring of cork could not be considered as a stopper. The witness, however, admitted that elastic rings had been long used in wooden taps, for preventing the escape of liquids. Other witnesses were called, who gave similar evidence, and testified to the utility of the plaintiff's invention, and the sufficiency of the specification.

Mr. Watson next followed on behalf of the defendant. He said he should not trouble the jury with the examination of further witnesses, as he considered his case was already proved. That part of the invention which it was alleged the defendant had infringed, consisted of a rigid stopper, a collar of elastic material, and an annular recess. Now the annular recess had been admitted to be old, and so also had the stopper and the collar. Thus much had been elicited from the scientific witnesses, who ought

really to be looked upon as advocates—as persons desirous of presenting facts in the most favorable light. But not a single glass bottle manufacturer had been called to state how much of the plaintiff's invention was new at the time the patent was granted, or they would doubtless have found that the nicks in the lip of the bottle were old. There was great difficulty in understanding the specification; its construction was very vague in some parts; and he should have to call the learned judge's attention to certain points. [The judge here explained that, according to the specification, the plaintiff's stopper might be used in other bottles than those having an annular recess]. The learned counsel then proceeded to state, that the specification contained two claims; the first of which was for the construction of the bottle,—that is, the combination of the nicks and the annular recess. Now there was no connection between these two parts. You might have the nicks without the annular recess, or *vice versâ*, without taking away from the utility of either. This combination he would submit was no new manufacture in the meaning of the Act of James I. As respected the second claim, which went for the stopper itself, every part of that had been proved to be old; and as no pretence had been set up that the first claim was infringed upon, he should confidently rely on a favorable verdict for the defendant.

The learned judge, in summing up, said that the plaintiff proposes to stop bottles by putting an inelastic stopper in the neck of a bottle, with an elastic collar lying between them; and it is complained that the defendant has infringed the plaintiff's patent by putting a ring of cork around the stopper—using an ordinary bottle with his compound stopper. It will be for you to say whether the patent is good. The first part of the plaintiff's patent is making bottles with an annular recess. Is this new? Then, is the plaintiff's mode of stopping bottles new? The defendant, you will understand, is not charged with making bottles, but making stoppers. Now the defendant's son tells you, he has seen nicks upon stoppers, but not nicks upon bottles. You will consider whether this evidence goes to shew want of novelty. Then there is the evidence of Mr. May, who may be called the witness in chief. He has seen elastic collars used; and he tells you, that the collars in the wooden taps are for preventing the escape of liquid past the plug. The recess in the neck of the bottles he tells you is old; but the object of the recess in Betts' patent is essentially different from that of the plaintiff's. It will, perhaps, be convenient, if I first leave this question to you. Are you of opinion that this elastic compound stopper is a new invention? You will first state your opinion upon this point. The jury, after a short consultation, found that the stopper was not new. A verdict was thereupon taken for the defendant, on the third and fourth issues, to the effect that the invention was not new, and that Stocker was not the first inventor.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th July to the 17th August, 1852, inclusive.

To Robert John Smyth, of Islington, in the county of Middlesex, for certain improvements in machinery or apparatus for steering ships and other vessels.—Sealed 19th July.

Frederick Sang, of No. 58, Pall Mall, in the county of Middlesex, Artist in Fresco, for certain improvements in machinery or apparatus for cutting, sawing, grinding, and polishing.—Sealed 19th July.

Richard Archibald Brooman, of Fleet-street, in the City of London, for improvements in the purification and decoloration of oils, and in the apparatus employed therein,—being a communication.—Sealed 19th July.

Richard Parris, of Long-acre, in the county of Middlesex, modeller, for improvements in machinery or apparatus for cutting and shaping cork.—Sealed 22nd July.

Joseph Maudslay, of the firm of Maudslay, Sons, and Field, of Lambeth, in the county of Surrey, engineers, for improvements in steam-engines; which are also applicable, wholly, or in part, to pumps and other motive machines.—Sealed 22nd July.

Charles Augustus Preller, of Abchurch-lane, in the City of London, Gent., for improvements in the preparation and preservation of skins and animal and vegetable substances,—being a communication.—Sealed 22nd July.

James Joseph Brunet, of the Canal Iron Works, Poplar, in the county of Middlesex, engineer, for certain improved combinations of materials in ship-building,—being a communication.—Sealed 5th August.

Henry Graham William Wagstaff, of Bethnal-green, in the county of Middlesex, candle-maker, for improvements in the manufacture of candles.—Sealed 5th August.

Edmund Morewood, of Enfield, in the county of Middlesex, and George Rogers, of the same place, Gent., for improvements in the manufacture of metals, and in coating or covering metals. —Sealed 5th August.

Ralph Errington Ridley, of Hexham, in the county of Northumberland, tanner, for improvements in cutting and reaping machines.—Sealed 5th August.

George Laycock, late of Albany, in the United States of America, dyer, but now of Doncaster, in the county of York, farmer, for improvements in unhairing and tanning skins.—Sealed 6th August.

James Warren, of Montague-terrace, Mile End-road, Gent., for improvements applicable to railways and railway carriages, and improvements in paving, applicable to bridges and flooring.—Sealed 17th August.

Francis Joseph Beltzung, of Paris, in the Republic of France, engineer, for improvements in the manufacture of bottles and jars of glass, clay, gutta-percha, or other plastic material; and caps and stoppers for the same; and in machinery for pressing and moulding the said materials.—Sealed 17th August.

List of Patents

Granted for SCOTLAND, from the 22nd July, to the 22nd August 1852.

To Joseph Haythorne Reid, late of 17th Lancers, Harrow-road, London, for improvements in propelling vessels.—Sealed 2nd August.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, London, civil engineer, for improvements in the construction of wheels for carriages,—being a communication.—Sealed 3rd August.

John Gerald Potter, of Over Darwen, in the county of Lancaster, carpet manufacturer, and Matthew Smith, of the same place, manager, for certain improvements in the manufacture of carpets, rugs, and other similar fabrics.—Sealed 5th August.

Ralph Errington Ridley, of Hexham, in the county of Northumberland, tanner, for improvements in cutting and reaping machines.—Sealed 6th August.

William Ackroyd, of Birkenshaw, near Leeds, for improvements in the manufacture of yarn and fabrics, where cotton, wool, and silk are employed.—Sealed 6th August.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, London, mechanical draughtsman, for improvements in the manufacture of metallic fences; which improvements are also applicable to the manufacture of verandahs, to truss-frames for bridges, and to other analogous manufactures,—being a communication.—Sealed 13th August.

Robert Hardman, of Bolton-le-Moors, in the county of Lancaster, mechanic,—for improvements in looms for weaving.—Sealed 18th August.

James Pilling, of Rochdale, in the county of Lancaster, spinner and manufacturer, for certain improvements in looms for weaving.—Sealed 20th August.

New Patents

SEALED IN ENGLAND.

1852.

To Henry Houldsworth and James Houldsworth, both of Manchester, silk manufacturers, for certain improvements in the fixing, extending, and holding of cloth to receive embroidery, and in apparatus applicable thereto. Sealed 27th July—6 months for inrolment.

James Denton, of Oldham, in the county of Lancaster, spindle and fly-maker, for certain improvements in machinery or apparatus for preparing cotton and other fibrous materials. Sealed 29th July—6 months for inrolment.

Frederick Winter, of Eldon-street, Finsbury, in the county of Middlesex, ruche manufacturer, for certain improvements in the construction of machinery for supplying rotatory motion to carriages, vessels, and water-mills. Sealed 29th July—6 months for inrolment.

John Martin, of Barmer, in the county of Norfolk, farmer, for improvements in implements for hoeing. Sealed 29th July—6 months for inrolment.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, for certain improvements in the manufacture of sheet-iron. Sealed 29th July—6 months for inrolment.

Pierre Armand Le Comte de Fontainemoreau, of South-street, Finsbury, London, for certain improvements in the construction of taps and cocks for fluids and liquids,—being a communication. Sealed 29th July—6 months for inrolment.

Henry Wickens, of Carlton Chambers, Regent-street, Gent., for improvements in obtaining motive power,—being a communication. Sealed 31st July—6 months for inrolment.

Samuel Starkey, of Clapton, in the county of Middlesex, Gent., for improvements in machinery for washing minerals, and separating them from other substances. Sealed 31st July—6 months for inrolment.

John Gerald Potter, of Over Darwen, in the county of Lancaster, carpet manufacturer, and Matthew Smith, of the same place, manager, for certain improvements in the manufacture of carpets, rugs, and other similar fabrics. Sealed 31st July—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of wheels for carriages,—being a communication. Sealed 31st July—6 months for inrolment.

William Ackroyd, of Birkenshaw, near Leeds, for improvements in the manufacture of yarn and fabrics, when cotton, wool, and silk are employed. Sealed 31st July—6 months for inrolment.

William Hetherington, of Handsworth, near Birmingham, Gent., for improved machinery for stamping or shaping metals,—being a communication. Sealed 3rd August—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of metallic fences; which improvements are also applicable to the manufacture of verandahs, to truss-frames for bridges, and to other analogous manufactures,—being a communication. Sealed 7th August—6 months for inrolment.

Roger Hind, of Warrington, in the county of Lancaster, for certain improvements in the construction of machinery or apparatus applicable to weighing-machines, weigh-bridges, railway turn-tables, cranes, and other similar apparatus. Sealed 7th August—6 months for inrolment.

Alexander Mills Dix, of Salford, in the county of Lancaster, brewer, for certain improvements in artificial illumination, and in the apparatus connected therewith; which improvements are also applicable to heating and other similar purposes. Sealed 7th August—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson & Co., of Fleet-street, in the City of London, for improvements in the manufacture of manure,—being a communication. Sealed 10th August—6 months for inrolment.

Edward Joseph Hughes, of Manchester, for improvements in machinery or apparatus for spinning and weaving cotton, wool, and other fibrous substances; and also in machinery or apparatus for stitching, either plain or ornamentally. Sealed 10th August—6 months for inrolment.

Robert Weare, of Plumstead Common, Kent, electrical engineer, for improvements in galvanic batteries. Sealed 12th August—6 months for inrolment.

Melchior Colson, of Finsbury-square, in the county of Middlesex, civil engineer, for certain improvements in the construction of vehicles. Sealed 12th August—6 months for inrolment.

Daniel Adamson and Leonard Cooper, of Newton Wood Iron Works, near Hyde, in the county of Cheshire, for certain improvements in the construction of steam-engines and steam-boilers; also in the method of using and rarifying steam;—part of which improvements are applicable to marine, locomotive, and other boilers, and marine architecture in general, as well as in cisterns, tanks, and articles of a like nature. Sealed 12th August—6 months for inrolment.

Richard Laming, of Millwall, in the county of Middlesex, chemist, for improvements in the manufacture and the burning of gas; in the treatment of residual products of such manufacture; and of the distillation of coal or similar substances; and of the coking of coal. Sealed 12th August—6 months for inrolment.

Nathaniel Jones Amies, of Manchester, manufacturer, for certain improvements in the manufacture of braid, and in the machinery or apparatus connected therewith. Sealed 12th August—6 months for inrolment.

François Bernard Bekaert, of Cecil-street, Strand, for improvements in the manufacture of zinc-white,—being a communication. Sealed 12th August—6 months for inrolment.

James Lowe, of Charlotte-place, Bermondsey, mechanic, and Thomas Eyre Wyche, of George-street, Mansion House, in the City of London, Gent., for improvements in propelling vessels. Sealed 19th August—6 months for inrolment.

William Palmer, of Sutton-street, Clerkenwell, manufacturer, for improvements in the manufacture of candles and candle-lamps, and in packing candles and night-lights. Sealed 19th August —6 months for inrolment.

Thomas Hunt, of Lemon-street, Goodman's-fields, in the county of Middlesex, gun-maker, for improvements in fire-arms. Sealed 19th August—6 months for inrolment.

Henry Rawson, of Leicester, for improvements in preparing and straightening wool and other fibrous materials. Sealed 19th August—6 months for inrolment.

Henry Spencer, of Rochdale, in the county of Lancaster, manager, for certain improvements in machinery or apparatus for preparing, spinning, and weaving cotton and other fibrous substances. Sealed 19th August—6 months for inrolment.

Charles Butler Clough, of Tyddyn Mold, in the county of Flint, Gent., J. P., for certain improvements in machinery or apparatus applicable to the purposes of brushing and cleaning. Sealed 19th August—6 months for inrolment.

Pierre Armand Le Comte de Fontainemoreau, of South-street, Finsbury, in the county of Middlesex, for certain improvements in cutting schistus for slates,—being a communication. Sealed 19th August—6 months for inrolment.

Samuel Nichols, of Coldham-street, Nottingham, mechanic; John Livesey, of New Lenton, in the county of Nottingham, draughtsman; and Edward Wroughton, of New Linton, in the same county, mechanic, for improvements in the manufacture of textile fabrics, and in machinery for producing such fabrics. Sealed 19th August—6 months for inrolment.

Henry Needham Scrope Shrapnel, of Gosport, for improvements in ordnance and fire-arms, cartridges, and ammunition or projectiles, and the mode of making up or preparing the same. Sealed 23rd August—6 months for inrolment.

Frederick Dam, of Brussels, chemist, for improvements in preventing incrustation in boilers. Sealed 23rd August—6 months for inrolment.

Josiah George Jennings, of Great Charlotte-street, Blackfriars-road, brass-founder, for improvements in water-closets, in traps and valves, and in pumps. Sealed 23rd August—6 months for inrolment.

Julius Roberts, of Portsmouth, Lieutenant in the Royal Marine Artillery, for improvements in the mariner's compass. Sealed 23rd August—6 months for inrolment.

Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, for improvements in the machinery and apparatus for printing fabrics and other surfaces,—being a communication. Sealed 26th August—6 months for inrolment.

Paul Joseph Poggioli, of Paris, in the Republic of France, Gent., for an improved medical compound. Sealed 26th August—6 months for inrolment.

George Twigg, of Birmingham, in the county of Warwick, button manufacturer, for certain improvements in the manufacture of buttons and other dress fastenings, and in the machinery and apparatus to be used therein. Sealed 26th August—6 months for inrolment.

Charles Cowper, of Southampton-buildings, Chancery-lane, for improvements in the application of iron to building purposes, —being a communication. Sealed 26th August—6 months for inrolment.

John Fish, of Oswaldtwistle, in the county of Lancaster, for certain improvements in looms for weaving. Sealed 26th August —6 months for inrolment.

Andrew Crosse, of Broomfield, in the county of Somerset, Esq., for improvements in the extraction of metals from their ores. Sealed 26th August—6 months for inrolment.

Pierre Amable de Saint Simon Sicard, of Paris, in the Republic of France, chemist, for improvements in enabling persons to remain under water and in noxious vapours. Sealed 26th August—6 months for inrolment.

James Lawrence, of Colnbrook, in the county of Middlesex, brewer, for improvements in brewing apparatus. Sealed 26th August—6 months for inrolment.

Disclaimers & Amendments

OF PARTS OF INVENTIONS

Made under Lord Brougham's Act,—subsequent to March, 1852.

Disclaimer and memorandum of alteration, entered and filed with the Clerk of the Patents for England on the 25th March, 1852, to parts of the specification of a patent granted on the 5th August, 1845, to William Eccles and Henry Brierly, both of Blackburn, in the County Palatine of Lancaster, spinners, for "improvements in the machinery or apparatus used in spinning."

Disclaimer and memorandum of alteration, entered and filed with the Clerk of the Patents for England on the 14th April, 1852, to parts of the specification and title of a patent granted on the 1st May, 1838, to Joseph Jepson Oddy Taylor, of Grace-

church-street, in the City of London, machinist, for "an improved mode of propelling ships and other vessels on water."

Disclaimer, entered and filed with the Clerk of the Patents for England on the 16th April, 1852, to part of the title of a patent granted on the 16th October, 1851, to William Onions, of Southwark, in the county of Surrey, engineer, for "improvements in the manufacture of nuts *and bolts; also of steps, bearings, axles, and bushes; also of* mills and dies for engravers; also of *bells,* lathe and other spindles; also of weft-forks, shuttle-tongues, and tips, for looms; *also parts of agricultural implements, chains, roller guides, and throstle-bars,* by the application of materials not hitherto used for these purposes," whereby the words in italics are disclaimed.

Memorandum of alteration, entered and filed with the Clerk of the Patents for England on the 8th May, 1852, to parts of the specification of a patent granted to Richard Prosser, of Birmingham, civil engineer, for "certain improvements in manufacturing buttons from certain materials; which improvements in manufacturing are applicable, in whole or in part, to the production of knobs, rings, and other articles, from the same materials."

Disclaimer, entered and filed with the Clerk of the Patents for England on the 20th May, 1852, to parts of the specification of a patent granted on the 6th April, 1851, to Robert Milligan, of Harden Mills, near Bingley, in the county of York, manufacturer, for "a new mode of ornamenting certain cloth fabrics."

Disclaimer and memorandum of alteration, entered and filed with the Clerk of the Patents for England on the 5th June, 1852, to parts of the specification of a patent granted on the 4th November, 1847, to Richard Laming, late of Clichy-la-Garenne, in the Republic of France, but now of Millwall, in the county of Middlesex, manufacturing chemist, for "certain improvements in manufacturing and purifying coal-gas, and in treating a residual product of such manufacture; also improvements in preparing materials to be used in the purification of coal-gas."

Disclaimer and memorandum of alteration, entered and filed with the Clerk of the Patents for England on the 20th July, 1852, to part of the title of a patent granted on the 20th January, 1852, to George Lowe, of Finsbury-circus, in the City of London, civil engineer, and Frederick John Evans, of Horseferry-road, in the City of Westminster, civil engineer, for "improvements in the manufacture of gas, for the purposes of illumination; and of improvements in the purification of gas; *and of improved modes of treating the products arising from the manufacture of gas,*"—whereby they disclaim the words in italics.

Disclaimer, entered and filed with the Clerk of the Patents for England on the 5th August, 1852, to parts of the specification of a patent granted on the 31st December, 1840, to John Grylls, of Cumberland-street, Portsea, for "improvements in machinery used for raising and lowering weights."

CELESTIAL PHENOMENA FOR SEPTEMBER, 1852.

D.	H.	M.	
1			Clock after the ☉ 0m. 16s.
—			☽ rises 8h. 15m. A.
—			☽ pass mer. 1h. 50m. M.
—			☽ sets 7h. 52m. M.
	7	32	☿ in conj. with Ceres, diff. of dec. 12. 38. S.
	22	23	Ceres in conj. with the ☉
2	7	12	♃'s first sat. will em.
		16	♃'s second sat. will em.
	18	0	☽ in Apogee
3	3	40	♅ in conj. with the ☽ diff. of dec. 4. 2. N.
	23	25	☿ in inf. conj. with the ☉
	—		Occul. 33, Piscium, im. 10h. 55m. em. 11h. 36m.
4	1	2	♄ in conj. with the ☽ diff. of dec. 1. 20. N.
5			Clock after the ☉ 1m. 33s.
—			☽ rises 9h. 33m.
—			☽ pass mer. 4h. 37m.
—			☽ sets 0h. 19m. A.
6	6	34	☽ in □ or last quarter
10			Clock after the ☉ 3m. 15s.
—			☽ rises 0h. 30m. M.
—			☽ pass mer. 8h. 53m. M.
—			☽ sets 5h. 7m. A.
		22	♂ in the descending node.
		26	♀ in conj. with the ☽ diff. of dec. 6. 9. S.
12	1	12	☿ in conj. with Pallas
	7	4	☿ in conj. with the ☽ diff. of dec. 6. 0. S.
	12	30	☿ stationary
13	10	38	Ecliptic conj. or ● new moon
14	22	0	☽ in Perigee
15			Clock after the ☉ 4m. 59s.
—			☽ rises 7h. 17m. M.
—			☽ pass mer. 1h. 26m. A.
—			☽ sets 7h. 21m. A.
	20	10	♂ in conj. with the ☽ diff. of dec. 5. 1. S.
16	10	38	☿ in the ascending node
	14	25	Vesta stationary
17			Mercury, R. A., 10h. 36m. dec. 8. 55. N.
—			Venus, R. A., 8h. 43m. dec. 15. 11. N.
17			Mars, R. A., 13h. 45m. dec. 11. 29. S.
—			Vesta, R. A., 3h. 18m. dec. 8. 25. N.
—			Juno, R. A., 0h. 17m. dec. 2. 1. S.
—			Pallas, R. A., 10h. 41m. dec. 0. 10. S.
—			Ceres, R. A., 11h. 24m. dec. 12. 9. N.
—			Jupiter, R. A., 15h. 9m. dec. 16. 53. S.
—			Saturn, R. A., 3h. 3m. dec. 14. 41. N.
—			Uranus, R. A., 2h. 23m. dec. 13. 43. N.
—			Mercury pass mer. 22h. 49m.
—			Venus pass mer. 20h. 57m.
—			Mars pass mer. 2h. 4m.
—			Jupiter pass mer. 2h. 23m.
—			Saturn pass mer. 15h. 14m.
—			Uranus pass mer. 14h. 34m.
18			Occul. γ Scorpii, im. 5h. 37m. em. 6h. 48m.
	7	34	♃'s third sat. will im.
19	22	51	☿ greatest elong. 17. 51. W.
20			Clock after the ☉ 6m. 44s.
—			☽ rises 2h. 5m. A.
—			☽ pass mer. 6h. 3m. A.
—			☽ sets 9h. 57m. A.
	1	17	☽ in □ or first quarter
	5	58	☿ in conj. with Pallas
21	0	12	☿ in Perihelion
22	9	41	☉ enters Libra, Autumn com.
23	21	47	Juno. oppo. ☉ intens. of light 0·318
24			Occul. 29, Aquarii, im. 11h. 19m. em. 12h. 31m.
25	7	25	♃'s first sat. will em.
28	6	25	Ecliptic oppo. or ○ full moon
30			Clock after the ☉ 10m. 8s.
—			☽ rises 6h. 54m. A.
—			☽ pass mer. 1h. 9m. M.
—			☽ sets 7h. 55m. M.
	7	0	☽ in Apogee
	7	12	♀ greatest elong. 46. 11. W.
	9	1	♅ in conj. with the ☽ diff. of dec. 3. 53. N.

J. LEWTHWAITE, Rotherhithe.

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RECENT PATENTS.

To THOMAS GREENWOOD, *machinist, and* JAMES WARBURTON, *worsted spinner, both of Leeds, in the county of York, for certain improvements in machinery for drawing and combing wool, silk, flax, hemp, and tow.*—[Sealed 3rd November, 1851.]

THIS invention consists, firstly, in a new arrangement of screw-gill drawing-head, which the patentees term the "intersecting screw-gill;" the object being to effect the operation of drawing wool, silk, flax, hemp, and tow, in a more expeditious manner than heretofore.

In Plate VII., the new arrangement of drawing-head is shewn, in cross section, at fig. 1. Eight screws *a, a,* and *b, b,* are used, instead of four (the ordinary number), for the purpose of giving the gills or fallers their necessary backward and forward travelling motions. The two lower pairs of screws are mounted in journals carried by the framing *c, c,* and by their rotation work the fallers *d, d,* in the ordinary manner; but the two upper pairs of screws *a, b,* are, as it were, inverted, and work the fallers *d, d,* with the gill-pins pointing downwards. These gills have the same relative position, with respect to the line of draught of the sliver under operation, as those of the lower set; and the gills of one set or row intersect the spaces between the gills of the other set or row, when in the position for working. By this arrangement, the sliver is penetrated both from its upper and its under surface; and thus it is more perfectly opened out prior to being subjected to the action of the drawing-rollers. It is requisite, with this arrangement of fallers and gills, that the pitch of the screws

a, a, which carry the fallers towards the drawing-rollers, should be greater than that of the screws ordinarily used for the like purpose, in order to allow the gills, in both the upper and lower row of fallers, to follow each other in the manner already indicated, and thereby to form a continuous horizontal body of pins, through which the material can be drawn. When the fallers reach the end of their course, the lower ones drop, and are carried backwards in the ordinary manner; but the upper ones (or those with the gills inverted), are lifted up to the top screws *b*, by cams, attached to the upper screws *a*, and are, by these screws *b*, carried backward to the position for commencing to repeat their forward traverse movement.

Motion is communicated to the screw-gill drawing-head by the bevil-wheel *e*, which takes into a bevil-pinion *e**, on the shaft of one of the traversing-screws; and this rotary motion is communicated, by suitable gearing *f, f,* to the other screws of the drawing-head. *g, g,* are the tables for supporting the fallers *d, d,* as they are respectively traversed forwards and returned by the screws *a, a,* and *b, b*;—*h, h,* are the retaining-rollers, by which the sliver to be operated upon is fed into the machine; and *i, i,* are the drawing-rollers, by which the sliver is drawn or elongated, and then delivered out of the machine: in effecting this, the rollers are assisted by the leather carrying-sheet *j*. In some cases it is proposed to make these drawing-rollers as shewn in the detached sectional view, fig. 2;—that is, with a portion of their periphery cut away on opposite sides of the rollers: by which means the rollers, although having a continuous rotary motion, will be made to act at intervals, instead of continuously. The effect of this intermittent drawing motion will be, to render the sliver stationary at given periods, while the gills have a continuous progression, whereby the sliver will be subjected to a combing action from the gill-pins.

From the foregoing description it will be understood that, for every revolution of the screw-shafts, two fallers instead of one are displaced; and therefore the machine is enabled to perform, by this arrangement, double the amount of work that the ordinary screw-gill drawing-head is capable of effecting in the same time.

The second part of this invention consists in a novel construction and arrangement of machinery for combing wool, silk, flax, hemp, and tow,—the object being to obtain an increased yield of valuable fibre from a given quantity of uncombed staple.

The improved combing machinery is shewn in side elevation

at fig. 3, and in vertical cross section at fig. 4. It consists chiefly of an endless series of combs, traversing in the manner of an endless chain from one end to the other of the machine. These combs are furnished with teeth or pins, which stand out in opposite directions in the same plane, and receive the wool or other staple, to be acted on, from a filling-head, that vibrates across the machine, at right angles to the line of traverse of the combs, and deposits the wool on each set of teeth or pins alternately. The combs, as they are fed with staple, are moved forward on a bed or table, and are brought severally under the action of a rotating-brush, which lays the fibres of the staple even and parallel. Immediately behind this brush there is a pair of stripping-rollers, which take up the long fibres of the staple, and deliver them out of the machine. The comb, thus partially stripped, passes under a second pair of stripping-rollers, which are set rather closer to the comb-teeth than the first pair; and by these the short fibres of the staple are taken up, and, in like manner, delivered out of the machine. The comb, now carrying only the noils and waste, next passes under a third pair of strippers, which deprive it of this fibre, and leave it in a clean state, ready to receive a second portion of staple. For this purpose, if the machine is furnished with but one filling-head, the comb is carried down from the table that supported it in its forward movement, and deposited on a rail below, along which it is slidden until it arrives at the front of the machine; and then it is lifted on to the table, and again brought under the vibrating filling-head, to receive another feed of staple, which is, in like manner, separated into long and short staple, by means of the brush and stripping-rollers, as already noticed.

The machine, represented at figs. 3, and 4, is supposed to be double; but, to prevent complexity, one filling-head only is shewn; and, for the same cause, the patentees proceed with their explanation as if a single machine were to be described;—it being premised, that to construct a double machine it is only necessary to duplicate the parts for filling in and stripping off the staple, and to lengthen the machine sufficiently to admit of the proper operation of these parts. A, A, are standards, connected together by longitudinal bars B, B, at their upper and lower extremities. C, C, is the bed, over which the bars, that carry the combs D, D, traverse. This bed C, C, is bolted to the standards A; and beneath it is a rail C*, which receives the comb-bars when they leave the bed C, and conducts them back to the front end of the machine. A connection is made between the bed and this rail, by the

semi-circular end-pieces E, E, which form guides for directing the comb-bars from the bed C, to the rail C*, and from the rail C*, to the bed respectively. These comb-bars are cast hollow,—forming a sort of rectangular trough, with flanges at the angles, which take into a groove in the face of the bed C. They are provided with a rack at their under side; and they carry, near their upper edges, the combs D, D, which are bolted to the sides of the bars.

The main driving-shaft of the machine is shewn at F, provided, at one end, with driving-pulleys G, G, and at the other with a crank-plate H, to which a rod I, is attached by a crank-pin. This rod I, is jointed to an arm K, which is keyed to a rock-shaft L, supported in bearings at the top of the standards A, A. Pendent from the shaft L, and keyed fast thereto, are the arms M, M, which form the framing of the oscillating feeding-head. Situated on either side of the machine is a bracket-frame, for supporting the balls of sliver N, intended to be operated upon. The several slivers are, at the starting of the machine, conducted down to the filling-head, and the balls N, are caused to unwind by the drag put on them by the oscillation of the filling-head as it is moved across the machine. The arms M, M, carry two pairs of rollers *a, a,* which receive the sliver and conduct it to a pair of gill-rollers *b*; and these again pass it down to a pair of sliding-combs *c,* which, when a given amount has been allowed to pass between them, close upon it, and hold it ready for delivering on to the traversing-combs D. The rotation of the rollers *a,* and *b,* is intermittent, and it is effected in the following manner:—On the axle of each roller *a,* of the upper pair, but at opposite ends thereof, a cog-wheel *d,* is mounted loosely; and each of these wheels is furnished with a click, which takes into a ratchet-wheel, keyed to the axle of its cog-wheel. Attached to the framing of the machine are segment-racks *e, e,* into which the cog-wheels *d, d,* gear, and thereby receive an axial motion when the arms M, M, oscillate across the machine. These wheels *d,* being mounted as described, will only communicate to the rollers the axial motion which they receive when the filling-head is moving towards the central line of its oscillation; and that motion will be in one and the same direction: viz., that suited for drawing in the sliver. On the filling-head passing in the opposite direction, these wheels *d,* merely draw their clicks over the ratchet-wheels, and produce no effect on the rollers. The several pairs of rollers are geared together, and intermediate wheels are employed to carry down the motion from the upper pair to the others.

It has been stated, that the combs *c, c,* are capable of sliding and closing upon the sliver that is fed out from between the gill-rollers. Now this is effected in the following manner:—O, O, are two vertical sliding-pieces, each of which is jointed loosely to a pair of levers P, P, supported on studs projecting from brackets attached to the arms M, M. The outer ends of these pairs of levers P, P, are bent upwards to form an incline; and they are intended to be brought alternately into contact with horizontal rods Q, (carried by brackets attached to the standards A, A,) as the filling-head oscillates from side to side of the machine. By this means the levers P, P, are made to rock upon their centres (their inner ends being depressed) when the contact takes place, which will cause the sliding-pieces, that are pendent therefrom, to be driven down; but, on the levers being released from the pressure of contact, the sliding-pieces will rise to their former position. The lower ends of these vertical sliding-pieces O, O, are made with inclined sides like a wedge; and they are inserted between the bars of the sliding-combs *c, c,* at the extremity of the filling-head, for the purpose of driving back the combs at the proper moment, and causing them to release their hold of the sliver. A tendency to move inwards is given to the combs by means of springs *g,* which are attached to the arms M, M, and come into operation immediately the combs are released from the pressure outwards of the sliding-pieces O, O.

It will now be understood, that when the filling-head has passed through the ascending arc of its oscillation, the levers P, P, by being brought into contact with the fixed rods Q, are made to depress the sliding-pieces O, O, and thereby open out a passage between the combs for the descent of a fresh supply of sliver; and, on the return-motion of the filling-head taking place, the cog-wheel *d,* will, in rolling over the stationary rack *e,* receive an axial motion, which will be communicated to the rollers *a,* and *b,*—whereby a fresh supply of sliver will be drawn down and made to depend from the lower end of the drawing-head. When this supply has been thus obtained, the pair of levers P, P, in contact with their rod Q, will be once more released, and the pressure of the springs *g,* will thrust forward the combs *c, c,* (the sliding-pieces O, O, being allowed to rise) and cause them to close upon the sliver. The filling-head now continuing its swinging movement will lash the sliver (pendent from its lower end) on to the teeth of the comb on the near side of the traversing comb-bars, and will then pass to the other side of the machine, to take up a posi-

tion for filling the sliver on to the teeth of the comb situate on the other side of the comb-bars. Immediately following this filling operation, one of a pair of brushes R, R, mounted respectively on the upper end of a bent rocking-lever S, (carried by brackets attached to the bed C, of the machine) comes forward and presses the sliver fairly on to the combs. The forward movement of these brushes, which are situated on opposite sides of the line of combs, is effected by means of a rotating cam or tappet T, mounted on the driving-shaft F: which tappet, by its rotation, is made to strike alternately against a friction-bowle on the lower end of the levers S, S. When the tappet has passed the bowle, the lever will assume its former position.

Supposing the comb-teeth, now under the range of the filling-head, to be charged with sliver, it is required to bring up other combs to be similarly supplied; and for this purpose it is necessary to move the filled combs towards the stripping-rollers. To effect this, rotary motion is communicated by bevil-gearing from the driving-shaft F, to the short vertical shaft *h*, which, by other bevil-gearing, communicates motion to a spur-pinion *i*, in gear with another pinion *k*, mounted on a horizontal shaft *l*, which turns in brackets in the end standard. Keyed to this shaft *l*, is a pinion *k**, that gears into the teeth of the racks with which the traversing comb-bars are provided, and thus, by its rotation, drives the combs forward towards the stripping-rollers. The comb-bars, it has been said, are traversed from the back of the machine to the front, along a bar C*. When they have arrived at the end of this bar it is required to lift them up on to the bed C: this is effected by means of a cog-wheel *m*, keyed on a shaft *n*, supported in brackets affixed to the front standards A. The wheel *m*, is mounted concentrically with the semicircular guide-bar E, and is of such a diameter that it will take into the teeth of the rack on the comb-bars, when those bars are pushed on to the guide-bar. By the rotation, therefore, of this wheel, the comb-bars are severally raised into a line with the bed C, and are pushed thereon by the next succeeding comb-bar that is elevated by the wheel *m*. Rotary motion is given to the wheel *m*, by means of an endless strap from a pulley *o*, on the shaft *l*, passing over a pulley *p*, on the shaft *n*. A similar arrangement is provided at the opposite end of the machine, for transferring the comb-bars from the bed C, to the rail C*; and on the shaft *n*, at that end, a pulley *q*, is mounted, which, by means of an endless strap, gives motion to a pulley *r*, mounted on the axle of a band-pulley *s*. This

pulley *s*, together with a similar one at the front end of the machine, carries an endless band *t*, *t*, which is provided with projecting fingers, for the purpose of catching against the hinder end of the comb-bars, as they are delivered on to the rail c*, and driving them forward to the front end of the machine.

The manner in which the feeding and the traversing of the combs is effected, having been described, it only remains to explain the operation of separating the different qualities of fibres, and of removing the noils and waste therefrom. *u*, *u*, *u*, are three pairs of brackets, affixed to the sides of the bed c. The first of these carries a rotary brush *v*, which lays the fibres on the comb-teeth parallel. This pair of brackets also supports the first pair of stripping-rollers *w*, and likewise a roller, round which an endless belt from one of these rollers *w*, passes, for the purpose of carrying up the fibres that are stripped off the combs by this first pair of strippers, and delivering it out of the machine. The distance of the rollers *w*, from the comb-teeth is so adjusted that they will take hold of the long fibres, and leave the shorter fibres to be stripped off by the second pair of rollers *x*, *x*. This second pair of rollers is brought somewhat nearer to the comb-teeth, and, by their action, the shorter fibres are removed from the combs;—a similar provision, to that already mentioned, being here made for delivering the sliver out of the machine. The combs next pass under the third pair of rollers *y*, by which they are cleared of the noils or knotted fibres, and are then ready to descend to the rail c*, and be traversed back to the front of the machine. But, supposing the machine to have two filling-heads, and two sets of strippers, the combs, when cleared by the strippers *y*, are brought under the second filling-head; and the same operations are repeated as before described. Rotary motion is communicated to the brush *v*, and rollers *w*, *x*, *y*, by suitable gearing from the driving-shaft F. Instead of brushes on the levers s, s, it is proposed, in some cases, to employ plates or bars. When a double filling-head is to be used, it may readily be attached to the rocking-shaft L, and will only require the duplication of the stationary racks *e*, *e*, for its efficient working.

The patentees claim, as their improvements in machinery for drawing and combing wool, silk, flax, hemp, and tow, Firstly,—the construction of drawing-head, as above described, whereby two sets of fallers or gills may be made to act simultaneously upon the sliver under operation; and also the construction of drawing-rollers, above described, whereby an

intermittent drawing motion is given to the sliver. Secondly,—with respect to the combing-machine, they claim the filling of the combs by means of an oscillating or swinging filling-head; also the employment of the retaining-combs *c, c,* for holding the sliver while it is being fed on to the traversing-combs; and likewise the use of double travelling-combs, or combs with teeth standing out in opposite directions, and at right angles to their line of motion. And, Lastly,—they claim the general arrangement and construction of the parts, as above described, and constituting the improved combing-machine.—[*Inrolled May,* 1852.]

To George Lowe, *of Finsbury-circus, in the City of London, civil engineer, and* Frederick John Evans, *of Horse-ferry-road, in the City of Westminster, civil engineer, for improvements in the manufacture of gas for the purposes of illumination, and of improvements in the purification of gas.*—[Sealed 20th January, 1852.]

The first part of this invention refers to certain means of enriching or improving the quality of gases, so as to render them fit for the purposes of illumination.

In carrying out this improved manufacture of gas, the patentees pass gas, obtained from any of the sources hereinafter specified, through heated retorts containing Cannel coal, coal, lignite, resin, pitch, tar, oil, retinite, or other substance or substances capable of yielding carburetted hydrogen gas: by which means such a combination of rich and poor gases may be produced as will be exactly suited to the purposes of illumination. For this purpose, it is proposed to use retorts open at both ends, as shewn in the drawing given in Plate VIII., which represents a longitudinal vertical section of the apparatus employed in carrying out this part of the invention. Only one retort is exhibited; but a similar arrangement of retorts may be adopted to that in general use in gas-works. *a,* is the retort, set in a suitable furnace for heating the same; and *b, b,* are mouth-pieces and lids, fitted to both ends of the retorts. *c,* is the pipe for carrying off the gaseous products generated in the retort; and *d,* is a pipe for introducing into the retort the gas which is intended to combine with the gaseous products of the substances under distillation in the retort. As soon as the retort is charged with coal or other carbonaceous matter, a cock *e,* in the pipe *d,* is opened, which allows the gas to flow into the retort; and it then passes in the direction of the arrows, and mingles with the

gas that is evolved from the carbonaceous matters contained in the retort: whereby a compound gas is formed, possessing a much higher illuminating power than could have been obtained had the combination taken place after instead of at the time of the generation of the gas in the retort *a*. The gas, which is brought to the retort by means of the pipe *d*, may be forced into the retort, so as to overcome the internal pressure put on the retort by means of the hydraulic main; or, instead thereof, an exhauster may be applied to draw off the gas from the retort. Should tar, oil, resin (previously melted), or any liquid hydrocarbon be employed for the generation of the gas, it is to be run into the retort in the way generally adopted for making oil or resin gas.

The sources from which the patentees propose to obtain inflammable gases, to be applied as above indicated, are wood, saw-dust in a damp or dry state, spent tanners' bark, and other like substances capable of yielding an inflammable gas. These substances must be put into a red-hot retort, and distilled like coal. The resulting gases may be either purified at once, or passed directly to the retort containing the coal or other carbonaceous material. As a general rule, however, these gases are preferred to be stored in gas-holders for use; as, in that case, a more uniform and constant supply to the coal retort may be relied on.

Another source of inflammable gas is from coal of an inferior description, or from peat. These substances having been distilled in a retort, the resulting gas can be then employed as above indicated. It is also proposed to conduct carbonic oxide gas into retorts containing carbonaceous matters under distillation. This gas the patentees obtain from carbonic acid, by passing the latter gas (which may be obtained from any convenient source) through a retort or furnace containing red or white hot coke. Or they utilize a portion of the gases generated in furnaces, by collecting these gases and converting the carbonic acid they contain into carbonic oxide, by passing them through a retort or furnace, as described for treating carbonic acid; or the gases may be conducted directly into retorts, wherein carburetted hydrogen is being generated, for the purpose of effecting the desired combination.

From the foregoing description, it will be understood, that the object of this part of the invention is to obtain gas of a uniform quality,—that is, possessing a definite amount of illuminating power. Now, it is well known that if the gas be too rich in carbon it will burn with a dull flame, and give

off a large amount of smoke; and that, if deficient in carbon, it will burn with a blue flame, and possess very little illuminating power. It is therefore proposed to mix the rich and poor gases, obtained as above described, in such proportions as will be needful to produce a highly illuminating quality of gas. As the proportions will depend entirely on the quality of the gases to be combined, no rule can be laid down for the amount of the gas required to be passed into the retorts, wherein the distillation is proceeding. The mode, however, in which the gas burns, on issuing from the retort, will be a sufficient test for the workman in attendance.

The second part of this invention refers to the purification of coal-gas from sulphuretted hydrogen; and consists in effecting this operation by the use of what has been considered by chemists to be the ferrate of potash, but what is now found to be a peroxide of iron in a peculiar state, and such as results from the employment of the following means:—First, the patentees heat together peroxide of iron and caustic potash or soda to a dull red heat, by which a kind of ferrate or ferrite of potash or soda is produced; and when this substance is washed in water, it undergoes decomposition, with the reproduction of caustic potash or soda (which remains in solution), and the precipitation of peroxide of iron in the state fit for the purification of gas. All or any of the peroxides of iron may be used for the above purposes, and will, by its means, become useful for purifying gas, though previously inert; and the solution of potash or soda, when evaporated to dryness, may be again and again employed upon fresh portions of peroxide of iron, so as to communicate to them the peculiar property desired. Or peroxide of iron may be heated with a smaller quantity of caustic potash or soda, and a portion of common salt, in order to economize the potash or soda: the heat in this case should be, as before, a dull red; and the same measures must be adopted for recovering the potash or soda and common salt, which may be used over and over again with fresh portions of peroxide of iron. Or the patentees heat the common hydrated peroxide of iron to about 600° Fahr.,—taking care that the heat never reaches a bright red; and in this way they obtain a peroxide of iron, having the requisite properties. Or they heat in the same way, and with the same precautions, such of the native ochres or ferruginous compounds as will, after such treatment, become rapidly black upon being subjected to the action of a stream of sulphuretted hydrogen.

A quantity of peroxide of iron, fit for purifying gas, having

been procured, by any of the means thus indicated, the oxide is next to be mixed with sawdust or other convenient material, and damped slightly with water; and the mixture is then to be spread in a dry lime purifier, and used in the way adopted with hydrate of lime; or it may be mixed with water, and run into a wet lime purifier, and used in the way adopted with regard to lime when employed in this kind of apparatus. In both cases it will be necessary, after the peroxide of iron has ceased to act upon the gas, to expose it to the air, by which its energies are renewed, so that it may be again and again used for the purification of gas. With the dry lime purifier, simple exposure is all that is required. With the wet lime purifier, the mixture must be run out and left at rest for some time; then, when the fluid has entirely separated from the solid part, it may be allowed to escape; and as the solid portion dries, its power will become renewed: after which it may be mixed with water, and employed as before. The renewal of the peroxide of iron, in both these cases, is known by its changing from black to red or deep brown.

Another part of the invention relates to the use of the sulphite and bisulphite of lead, for the removal of the sulphuretted hydrogen of coal-gas.

These substances are to be employed singly or together, mixed with water, in a wet lime purifier, exactly as is practised with regard to lime. When they cease to purify the gas, the mixture is run out of the purifier; and after the water has been removed by subsidence and decantation, or by a filter, the residue is dried and burned, so as to make sulphurous acid, which is employed in the manufacture of fresh sulphite or bisulphite of lead, or in the production of sulphuric acid. The matter which remains, after this burning process, is carefully roasted, and thus converted into oxide of lead or litharge, from which sulphite or bisulphite of lead may be again produced.

The patentees claim the combining of gases which possess different degrees of illuminating power, by the introduction of gas, obtained in any of the ways above indicated, into retorts or vessels containing carbonaceous matters under distillation. They also claim, as their improvements in the purification of gas, First,—the use of anhydrous peroxide of iron, prepared as above described; and, Secondly,—the use of sulphite and bisulphite of lead, for the removal of sulphuretted hydrogen from coal-gas.—[*Inrolled July,* 1852.]

To George Jordan Firmin, *of Lambeth-street, Goodman's-fields, in the county of Middlesex, manufacturing chemist, for improvements in the manufacture of oxalate of potash.* —[Sealed 24th June, 1851.]

This invention consists in manufacturing oxalate of potash by employing oxalic acid and water to act on a salt of potash.

When tartrate of potash (which the patentee prefers) is the salt to be acted upon, the operation is as follows:—After the excess of acid contained in cream of tartar has been saturated by carbonate of lime, the supernatant liquor, which contains neutral tartrate of potash, is run into a suitable vessel; and then, for every hundred pounds of the neutral tartrate of potash, an addition is made to the solution of about sixty pounds of crystallized oxalic acid (previously dissolved in about its weight of water), or as much as will combine with one-half of the potash and form neutral oxalate of potash, which is held in solution, while the acid of the tartrate unites with the other half of the potash and forms cream of tartar, which is precipitated. In this process no heat is required; as the tartrate of potash and oxalic acid being in a state of solution, the precipitate falls on mixing them. The precipitated cream of tartar is collected in a filter, and washed, to free it from any of the oxalate of potash which may be mechanically mixed with it; and then it may be again saturated with carbonate of lime, as before mentioned. To the liquor containing the oxalate of potash, is added the same quantity of oxalic acid as was used to obtain the neutral oxalate, or as much as is required to constitute the superoxalate of potash; and this is heated, filtered, evaporated, and crystallized in the ordinary manner.

To manufacture oxalate of potash from sulphate of potash, a given quantity of the sulphate of potash of commerce is heated, in about five times its weight of water, to 180° Fahr.; then, for every hundred pounds of the sulphate of potash, about one hundred and sixty pounds of crystallized oxalic acid are added (or as much as is required to combine with the potash of the sulphate and form superoxalate of potash); and these are well mixed together,—the heat being maintained at about 180° until the salts are dissolved. The mixture being then allowed to get cold, the superoxalate is deposited on the bottom and round the sides of the vessel; and after the liquor, which is sulphuric acid, has been removed, the superoxalate of potash is washed, dissolved, filtered, and evaporated in the usual way.

If muriate of potash is the salt employed for making oxalate of potash, it is dissolved in about four times its weight of water, heated to 180°; then, for every hundred pounds of muriate of potash, about one hundred and forty pounds of crystallized oxalic acid are added (or as much as is required to decompose the muriate of potash and form muriatic acid and superoxalate of potash); and the mixture is agitated until the salts are dissolved. The liquor being allowed to cool, the superoxalate of potash is deposited on the bottom and around the sides of the vessel; and it is then collected, and, after being washed to free it from any muriatic acid, it is dissolved, filtered, evaporated, and crystallized. If any escape of muriatic acid gas takes place during the process, more water should be added;—or the salt and acid should be decomposed in a close vessel (furnished with an agitator), from the top whereof a pipe should lead into a second vessel containing water, by which the gas is taken up; and this vessel should be connected with as many other vessels, each containing water, as may be requisite to prevent the escape of the gas. The cold liquor, run off after the decomposition, is evaporated, and the muriatic acid collected in the manner just described; and the residue, consisting of a little superoxalate of potash and impurities, is either added to a fresh quantity of muriate of potash or treated according to its value.

Lead vessels may be used in the decomposition of the tartrate and sulphate of potash, and the subsequent treatment of the superoxalate of potash; but in any part of the process with muriate of potash, in which its acid is liberated, stoneware vessels should be employed.

The patentee claims, as his invention, the manufacture of oxalate of potash by employing oxalic acid and water to act on a salt of potash, as above described.—[*Inrolled Dec.* 1851.]

To WILLIAM EDWARD NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in warming and ventilating buildings,—being a communication.*—[Sealed 22nd May, 1850.]

THIS invention relates to various improvements upon an invention for which letters patent were obtained on the 5th of June, 1849.*

In carrying out the present improvements, the inventor makes use of stoves, grates, or fire-places, constructed very

* For description of this invention see Vol. XXXVI. of our present Series, p. 76.

much on the same principle as those described in the specification of the former patent; but, in conjunction therewith, he employs a syphon-tube, whereby he is enabled either to throw warm air into the room, or to extract and carry off the foul and vitiated air from the upper part of the room, and convey it into the chimney. He also proposes to construct a close stove, in such a manner that it may be used both for warming the air and for culinary or domestic purposes. In the upper part of the close stove, described in the abovementioned specification, there was a vacant space, in which an oven is now placed, for the purpose of cooking or baking bread. Beside this oven, a moveable oven or chamber is intended to be suspended in front of the fire for roasting meat; —the glass or wire-gauze door, described in the former specification, being previously removed, in order that the full intensity of the fire may act on the meat. In place of the oven or chamber just mentioned, a kettle or vessel for heating water may, if required, be placed in front of the fire, upon a suitable stand, suspended in front for that purpose. Another kettle may also be placed on the flue, at the back of the stove.

In Plate VIII., fig. 1, is a front view of an open fire-place, constructed according to the present improvements, with the arrangements for ventilating adapted thereto; fig. 2, is a vertical section thereof; and fig. 3, is a horizontal section of the same. Upon referring to figs. 2, and 3, it will be seen, that the fire-place or grate consists simply of a box, made of sheet-iron, and furnished with a lining of fire brick: the lower end of this fire-brick lining is inclined outwards, for the purpose of reducing the capacity of the grate without at the same time diminishing the extent of the radiating surface. The fire-place or grate is placed in the usual recess under the chimney, the lower end of which is closed, as shewn in fig. 2, leaving only an opening for the metal flue *f*, of the fire-box. The space E, round the grate is closed in front by the plate D, so as to form a close chamber, into which air may be admitted from the lower part of the room at the openings B, B, fig. 1,—such openings being furnished with valves or slides, so as to be opened or closed at pleasure. From the upper part of the space E, rises a pipe F, the upper end of which communicates with the upper part of the room near the ceiling, as shewn at figs. 1, and 2. It will now be understood that cold air may be admitted to the space E, through the holes or openings at B, and, after being warmed in the space E, it will pass up the pipe F, into the room. A continuous current is

thereby produced; so that the air admitted to the space E, is not burned, but merely warmed before it issues into the chamber. If by this arrangement the atmosphere of the room is rendered too warm, it will only be necessary to close the openings B, B, by means of their slides or valves; and then there will be no current of air through the pipe F, and, consequently, no escape of heated air into the room. The same arrangement may be also used for ventilating or airing the room: for which purpose it will only be necessary to cause the heated and vitiated air, at the upper part of the room, to pass down the pipe F, into the space E, whence it will be conveyed into the chimney through the short pipe G. This pipe is shewn with its mouth bent downwards, in order to prevent soot or other matters from getting into it; but this object may be effected, even if the pipe be straight, by merely adapting a cap or cover to it. The pipe G, is also furnished with a throttle-valve *h*, which is worked by a stud or button *i*; and when the room requires ventilation, it will only be necessary to open the valve *h*, and close the valves B, B; then the heated and vitiated air from the room will pass down the pipe F, into the case E, which is filled with hot air; and the heated and vitiated air that has been thus drawn from the room into the case or chamber E, will pass up through the short pipe G, into the chimney. On the other hand, when the room requires warming, the throttle-valve *h*, must be closed and the valves B, B, opened; then, as before mentioned, cold air will enter the casing E, at B, B, and will be warmed therein by coming into contact with the heated sides of the case E, and, by ascending the pipe F, will escape into the room at an agreeable temperature.

Fig. 4, is a vertical section, and fig. 5, is a horizontal section of a fire-place, shewing a somewhat different mode of carrying out the improved mode of ventilation. In this instance the lower part or aperture of the chimney is not closed, as in figs. 1, 2, and 3; and the construction of the fire-place is such that it may be applied with facility to any chimney, without the necessity of closing the bottom part, as in the former case. Upon referring to figs. 2, and 3, it will be seen that the fire-place consists simply of a box or case of sheet-iron, placed in the recess under the chimney, and enclosed in front by a metal plate, as shewn at fig. 1. In figs. 4, and 5, however, the fire-place is enclosed in an outer casing, so as to form a space E, between the outer and inner casings; into which space E, air is admitted, either at the bottom or from the upper part of the room, as will be hereafter explained.

The ventilating tube F, which conducts the vitiated air from the upper part of the room, also terminates at bottom in this chamber.

When it is required to warm the air of the room by passing a portion of it through the space E, air is admitted through the pipe B, (fig. 5,) from which a branch pipe leads to the space E. The pipe B, is furnished with a piston *b*, which may be moved backwards and forwards in the pipe by the rod *c*. Now, when the piston is pushed back into the position shewn by dots, it will be seen that air may freely pass from the room, along the pipe B, into the space or chamber E, where it will be warmed by contact with the heated sides of the fire-place, and thence it will pass up the pipe F, into the room at an agreeable temperature. If, however, it should be desired to ventilate the room, and draw off the foul and vitiated air from the upper part, it will only be necessary to draw back the piston *b*, into the position shewn by the full drawn lines, and the current of air will be reversed; so that the air from the room will be prevented from entering the space or chamber E, through the pipe B, as the piston will close the outer end of the pipe. Air from the upper part of the chamber will therefore enter the pipe F, and descend the same into the chamber E, whence it will pass out through the opening at the inner end of the pipe B, and then ascend the chimney with the vapours of combustion.

This mode of ventilating or airing a room is founded on what the inventor denominates the syphon principle. Upon examination, it will be found to differ essentially from any of the plans hitherto adopted for causing the heated and vitiated air from a room to pass through a valve or opening into the chimney. The improved plan is caused to act by reason of the tendency of air to pass down any channel that leads to a more rarified atmosphere. Now it must be evident that when the casing E, has no communication with the external atmosphere, except through the pipe F, that the air in the casing will become rarefied by the heat of the fire; and the air in the upper part of the room not being so rarefied as that in the casing, will rush down the pipe F, into the casing, and thence it will be expelled into the chimney, where the air is also rarefied by the heat of the fire. It will be understood that the air in the pipe F, will also be so rarefied by the heat in the chimney, that the air from the room will rush into the pipe, even if it be not connected with an air-chamber, such as is shewn at E. In fig. 6, the improved system of ventilation is shewn applied, in this manner, to a chimney to which the flue

of a stove is adapted. The stove, constructed according to the improved plan described in the former specification, is shewn at S,—or any other close stove may be employed. The tubular iron flue from the stove is inserted into the chimney, which is closed at bottom, in order to exclude any air except that which passes through the stove. The syphon-pipe is shewn at F: it is furnished with a valve *h*, and button *i*, for opening or closing a communication with the room. The heat of the chimney is sufficient to rarefy the air in the pipe F, and thereby cause a draft from the room, which will, by this means, be kept free from vitiated air; as a continual supply of fresh air will be always drawn into the room through the openings in the doors and windows. The door of the stove is made of fine wire gauze, which will admit of air passing to the fire, and will prevent smoke from issuing into the room, as the wire gauze acts as a blower.

Fig. 7, is a longitudinal vertical section of an improved economical cooking stove. The fire-box is surrounded with an outer casing *k*, *k*, so as to warm a body of air, and allow the same to issue from the openings *e*, at top. In the upper part of the stove an oven *o*, for baking, is formed; and the flue-pipe *f*, is, in this instance, made flat, in order that a kettle or other vessel, containing water, may be placed thereon: small saucepans, flat irons, or other articles, may also be heated thereon. In order to roast any meat in front of the fire, it will be necessary, first, to remove the wire gauze door, which, for this purpose, is merely suspended on vertical pivots. The joint of meat to be roasted is secured on a spit, and placed in a moveable oven,—a pan or vessel being put underneath, in order to receive the gravy from the meat. If it be required to boil the contents of a large vessel, this may be done by suspending a trivet or some other support in front of the fire (the wire-gauze door being, of course, previously removed), and placing the saucepan or other vessel thereon, in immediate contact with the fire.

In conclusion, the patentee states that what he claims is,—warming or ventilating a room or chamber by means of a pipe or tube, placed in the chimney-shaft; one end of which tube communicates with the atmosphere of the upper part of the room, while the other end terminates in a close chamber or air-space, contiguous to the fire-place, as seen at E, figs. 1, 2, 3, 4, and 5,—whereby warm air may be passed through the apparatus into the upper part of the room, or the hot and vitiated air may be drawn off from that part and passed up the chimney. Likewise the plan shewn in fig. 6, or any

mere modification thereof, for drawing off foul or vitiated air from the upper part of rooms, by means of a syphon-tube, which communicates, at one end, with the upper part of the room, while the other end terminates near the exit or smoke-pipe of the stove or fire-place. Also the construction and arrangement of stove shewn in fig. 7, in which the improved stove is shewn as applicable for culinary and domestic purposes, as well as for warming the air of rooms.—[*Inrolled November*, 1850.]

To WILLIAM BECKETT JOHNSON, *of Manchester, in the county of Lancaster, manager for Messrs. Ormerod and Son, engineers and iron-founders, for certain improvements in steam-engines, and in apparatus for generating steam,—such improvements in engines being wholly or in part applicable where other vapours or gases are used as the motive power.*—[Sealed 12th December, 1850.]

THE improvements in engines to be worked by steam or other vapours or gases, which constitute the first part of this invention, consist, firstly, in certain arrangements or modes of constructing parts of stationary engines, known by the name of "horizontal engines," in which the piston works in a horizontal line, or nearly so; secondly, in certain arrangements or modes of constructing parts of stationary engines, in which the cylinder is placed in a vertical position, but with the piston-rod working through the bottom of the cylinder, and coupled with the main shaft beneath by the connecting-rod and crank,—which engines the patentee calls "inverted cylinder-engines;" thirdly, in certain modes of constructing metallic packed pistons, applicable to stationary, locomotive, and marine engines; fourthly, in certain modes of constructing metallic packed D-valves, applicable to stationary, locomotive, and marine engines.

The improvements in apparatus for generating steam consist, firstly, in making stationary boilers with a peculiarly constructed steam-chamber, placed on the top of and forming part of the entire length of the boiler; secondly, in making stationary boilers with a smoke-box or chamber at the end of the flue or flues leading from the furnace; and, thirdly, in constructing the parts of boilers above the furnaces or flues of a curved form.

The improvements in horizontal engines are shewn in Plate VIII., at fig. 1, which represents a longitudinal section of a horizontal engine. *a*, is the steam-cylinder, which,

together with the piston *b*, piston-rod *c*, connecting-rod *d*, crank *e*, and shaft *f*, may be of the usual construction. *g*, is the valve-box, and *h*, the slide-valve, which may also be of the ordinary construction, and placed either at the top of the cylinder or on one side thereof. *i*, is the condenser, placed immediately under the steam-cylinder *a*, and forming also that part of the framing to which the cylinder is attached. The steam from the cylinder is admitted into the condenser through openings or passages *j*, or in any other convenient manner, as may be required by the position and description of steam-valves applied to the cylinders. The injection-water may be admitted at either side or end of the condenser. *k*, is the foot-valve leading to the air-pump. The end *l*, of the piston-rod is fixed to the mounting or cross-bar *m*, to which is attached the connecting-rod *d*. To the pin or centre *n*, on each side of the mounting, a lever *o*, is connected; and the upper ends of the levers are fixed to a centre *p*, and are allowed to move vertically in the slots or guides *q*. To centres *r*, on each side of the levers *o*, are attached the upper ends of the radius levers *s*; and such levers are fixed, at the lower part thereof, to the shaft or centre *t*. The length of the radius levers and positions of the centres *r*, in the levers *o*, must be so proportioned that the centre *n*, will move in a straight line, and in the same plane as the centre of the cylinder. *u*, is the air-pump, which is placed between the cylinder and the main shaft, and has branches *v*, and *w*, to connect it with the condenser and hot well,—*k*, and *y*, being the foot and delivery-valves. In this arrangement, the air-pump piston is plain, not having any valves fixed to it; but, if desired, the foot-valve may communicate with the underside of the air-pump bucket, and deliver the water and vapour from the condenser into the hot well by the mode usually adopted. The air-pump is worked by fixing upon the shaft *t*, a lever or levers *z*, and connecting the same by the links a^1, with the air-pump cross-bar b^1; and any required degree of motion may be given to the air-pump rod c^1, and piston d^1, by making the lengths and positions of the centres of the levers *z*, *s*, and *o*, of proper proportions. The air-pump may also be worked when motion is given to the lever *z*, by other means than here shewn; as would be the case were guides employed instead of a parallel motion to guide the end of the piston-rod: in which arrangement the levers *o*, may be dispensed with,—the upper ends of the levers *s*, being coupled, by any suitable means, directly with the centre *n*. The hot well e^1, is placed between the air-

pump and the main shaft, having a branch f^1, to communicate with the delivery-valve *y*, and an over-flow pipe g^1. In the arrangement here shewn, the hot well is in the centre, and forms part of the foundation-plate; but, if desired, it may be placed at either side of the air-pump, and yet form a part of the foundation-plate.

The improvements in inverted cylinder-engines are exhibited at figs. 2, 3, and 4,—fig. 2, being a vertical section of an inverted cylinder-engine, and figs. 3, and 4, horizontal sections thereof, drawn on a larger scale. *a*, is the steam-cylinder, *c*, the piston and rod, *d*, the connecting-rod, *e*, the crank, and *f*, the main shaft: all of which may be of the ordinary construction. The steam-cylinder is placed upon the framing *g*, which is made upon the box form or principle, being circular in its horizontal section (as is shewn at figs. 3, and 4,) and decreasing in diameter from the base towards the top. In the framing are certain openings *h*, h^1, for the convenience of access to the working parts. At any required distances, flanches or circular ribs *i*, are formed in the framing, for the purpose of giving additional firmness, and attaching thereto certain of the working parts of the engine, and also for jointing or uniting the framing when it is made of two or more pieces in height: these ribs may either be inside or outside of the body of the framing, as may be desired. Vertical ribs *j*, may also be added, giving still further stability to the framing. In the openings h^1, are formed, or are attached to the sides thereof, the guides *k*, for receiving the ends of the piston-rod cross-bar *v*. At the base, and inside of the framing, is fixed the main shaft bearing *l*, which must be firmly secured to the outer body of the framing, either by having an internal flanch, cast with the framing, to receive it, or by any other suitable means. The condenser *m*, is placed at some distance from, but immediately under, the cylinder. The exhaust steam from the cylinder is conveyed into the condenser, either by a channel *n*, formed in the framing, or by a separate pipe, as may be most convenient. *o*, is the branch leading from the condenser to the foot-valve *p*; *q*, is the hot well, placed at some distance from but under the cylinder; *r*, is the branch leading from the delivery-valve *s*, into the hot well; and *t*, is the overflow-pipe. In this arrangement, the condenser occupies nearly one half of the base of the framing, and the hot well the other half, except the centre space *u*, required for the revolution of the crank and its appliances. The proportions and arrangement and construction of the condenser and hot well may, if desired, be varied from what is here shewn, and yet be

under, but at some distance from, the cylinder. The branches to the foot and delivery-valves are shewn in the same horizontal line; but they may be made with the delivery-valve immediately over the foot-valve; or some other arrangement may be adopted to connect the air-pump with the condenser and hot well, when they are placed in the positions represented in the Plate. The condenser and hot well are shewn in one piece with and forming the base of the framing; but they may be made separate from the framing, and also be made each of separate pieces, and yet form a base for the framing. *v*, is the piston-rod cross-bar, to which are attached two rods *w*, one placed on each side of the connecting rod. The lower ends of the rods *w*, are secured to the ends *x*, of the levers *y*, which vibrate upon the centre *z*; and the ends a^1, of the levers *y*, are connected by rods b^1, to the air-pump rod c^1: by which means any required degree of motion may be transmitted from the piston-rod cross-bar to the air-pump bucket d^1, by a suitable proportion of the parts of the apparatus above described. In this arrangement, the motion of the air-pump bucket is opposite to that of the piston-rod cross-bar, or, one is ascending whilst the other is descending, and thereby the working parts of the engine are partly balanced, If it be desired, the air-pump may be worked from a centre, placed on the same side of the fulcrum *z*, of the lever as that to which the ends of the rods *w*, are attached: in this arrangement, the ascent and descent of the air-pump bucket and piston-rod cross-bar will be simultaneous. The ends of the piston-rod cross-bar *v*, are inserted in the guide-blocks e^1, (see fig. 4.). The sides of the guides *k*, are made angular, tapering towards the centre of the framing; and the guide-blocks are made to fill the guides, by being drawn upon the ends of the piston-rod cross-bar by the screws f^1: which operation must be repeated when the guide-blocks have become slack by working. The sides of the guides *k*, are made in one piece with the framing; but they may be made separate, and attached to the framing by bolts and nuts. The tapering or angular position of the sides of the guides may be reversed,—the widest part being towards the centre of the framing; but the arrangement here shewn is preferred, as being more convenient for putting together and adjusting.

The improvements in metallic packed pistons are represented at figs. 5, and 6,—fig. 5, being a horizontal section, and fig. 6, a vertical section of a piston. *a*, is a portion of the cylinder; *b*, is the principal packing-ring, whereon the spring *c*, acts, by being placed between the snugs *d*, which

are of the same piece, or are fixed to the principal packing-ring; and *e*, is a nut, fitting the screwed pin *f*, for the purpose of adjusting the force of the spring. The principal packing-ring is cut through or divided diagonally between the snugs *d*. *g*, *g*, are two minor rings, made about one half the thickness of the principal ring, and fitting truly upon it;—they are cut through or divided opposite to the division of the principal ring, and kept in this position by the steady pins *h*. These rings are for the purpose of preventing the steam from passing through the division of the principal ring. This may also be effected by using parts of instead of whole rings: which parts of rings must be fitted over the division of the principal ring, and extend for a sufficient distance on each side of the opening, so as to make the piston steam-tight at this part. If desirable, more than one spring may be applied to the packing ring or rings,—the springs being applied, and the rings made steam-tight at the divisions by the method just described. The body part *i*, of the piston and loose ring *k*, may be made of the ordinary construction.

The improvements in metallic packed D-valves are shewn at figs. 7, and 8, which are sectional views of a D-valve, taken at right angles to each other. *a*, is the valve-block face; *b*, is the section of the valve-casing; *c*, *c*, are the principal packing segments; and *d*, *d*, are snugs, which are of the same piece, or are fixed to the principal packing segments. Between the snugs *d*, is placed the spring *e*; and by the nut *f*, fitting the thread of the screwed pin *g*, the spring may be made to expand the principal packing segments with the required degree of force. The principal packing segments are divided diagonally between the snugs *d*; and over this opening or division, and at the outer edge of the principal packing segments, are fitted two minor segments *h*, which are about one-half the thickness and about one-sixth the depth of the principal packing segments. The ends c^1, of the principal packing segments, which fit against the valve-face *i*, are made angular, or of a wedge-form, so that the action of the spring upon the principal packing segments will keep the valve against the valve-block face, and also keep the ends *c*, of the principal packing segments in contact with the valve-casing. If desired, more than one spring may be applied to the packing of the D-valve made upon this construction,—the additional springs, snugs, divisions, and minor segments, being a repetition of what is above described. The body *k*, and loose segment ring *l*, are made similar to the same parts of an ordinary metallic packed piston, with the exception that only a part is

required instead of the whole body and loose ring of the piston.

The improvements in apparatus for generating steam are represented at figs. 9, 10, 11, and 12. Fig. 9, is a longitudinal section, and fig. 10, a transverse section of a boiler, in which part of the improvements are shewn. *a*, is the lower part of the outside shell of the boiler, which, to *b*, is made circular in its transverse form. *c*, is the upper part of the outside shell, which, to b^1, is also made circular in its transverse form. The upper part is firmly secured to the lower part at b^2, by rivetting. Strong stays *d*, are placed at proper distances, to connect the shell of the boiler together at b^2. By this construction of the outer shell of the boiler, the furnace part *e*, may be made circular, and also to occupy the whole of the lower part, except the room required for water-space. If desired, two furnaces may occupy the lower part. The upper part of the outside shell is constructed for a steam-chamber, and is shewn continued for the entire length of the boiler; but, if desired, it may be made less in length than the lower part of the shell of the boiler. The upper and lower parts of the shell of the boiler are here shewn as two arcs of circles, except at the parts between *b*, and b^1; but, if desired, they may be made arcs of ellipses. The plate *f*, to which the flues *j*, are fixed, constitutes the end-plate of a smoke-box, and the plates *g*, *g*, form the side or circumference thereof. In the bottom is constructed the flue *h*, which is connected by suitable flues to the chimney. *i*, is a doorway, fitted with a door *k*, by which the flues are rendered accessible for cleaning out and repairing. The smoke-box is surrounded with water at all parts, except at the ends of the flues leading from the furnace, the door-way for cleaning, and at the flue leading out of the smoke-box. In this arrangement, the smoke-box is made of a circular form, in transverse section, which is most suitable for the outside shell of the boiler that contains it, as also for strength; but, if desired, this form may be altered to one that will more conveniently apply to the form of the outside shell of the boiler and arrangement of flues to which it may be adapted.

Fig. 11, is a longitudinal section, and fig. 12, a transverse section of the furnace-end of a boiler, constructed according to another part of these improvements, which consists in making those parts that are above the furnace or furnaces at one end, and above the flue or flues at the other end, of a curved form,—thereby dispensing with end-stays, and also adding strength to those parts. *a*, is the top of an internal furnace or flue; *b*, is the top of the boiler-shell; and *c*, is the end-

plate of the boiler, which, above the furnace or flue, is made of a curved form,—the upper parts of the two ends of the boiler curving towards each other. The curved part is here shewn to be a portion of a circle, that being the most simple in construction, and also possessing great strength; but such other curved forms may be adopted as will most easily unite with the transverse form of the shell of the boiler. This improvement is also shewn applied to the boiler exhibited at figs. 9, and 10.

The patentee claims, in reference to engines to be worked by steam, or by other vapours or gases, Firstly,—the use or employment of a condenser, applied to horizontal engines, placed under the steam-cylinder, and formed in or as part of the framing or foundation-plate. Secondly,—the employment of a parallel motion, applied to horizontal engines, to guide the piston-rod, as described in reference to fig. 1. Thirdly,—the employment of an air-pump, applied to horizontal engines, placed about the centre of the engine, in a transverse direction, and between the cylinder and the main shaft longitudinally. Fourthly,—the employment of a lever for working the air-pump, applied to horizontal engines, as described and exhibited in fig. 1. Fifthly,—the employment of a hot well, in horizontal engines, cast in or otherwise forming a part of the foundation-plate. Sixthly,—the employment, in inverted cylinder-engines, of a box-framing, circular in horizontal section, having openings formed therein; and also providing the said framing either with internal or external flanches or ribs, for the purpose of strengthening the same, and also for affording the means of joining when made of two or more pieces. Seventhly,—the employment, in inverted cylinder-engines, of a condenser and hot well, placed under the steam-cylinder, and forming the base (or part thereof) of the framing. Eighthly,—the employment, in inverted cylinder-engines, of a lever or levers for working the air-pump, when motion is given to such lever or levers by connecting-rods, worked from the piston-rod cross-bar. Ninthly,—the employment, in inverted cylinder-engines, of slides or guides to guide the piston-rod, having the sides made angular, whether such guides are cast with the framework or formed in separate pieces. Tenthly,—the use or employment, in metallic packed pistons, of a spring or springs, so arranged that the expansive power thereof shall act in a line constituting a chord to the circle of the piston. Eleventhly,—the use or employment, in metallic-packed D-valves, of a spring or springs, so arranged that the expansive power thereof shall

act in a line constituting a chord to the arc of the back of the valve.

In reference to apparatus for generating steam, he claims, Firstly,—so constructing the shell of a stationary boiler that the transverse form shall be composed of two arcs of circles, or of ellipses, one placed above the other, and strengthened with transverse stays. Secondly,—the employment, in stationary boilers, of a smoke-box, placed at the end of the flues leading from the furnace or furnaces, and also surrounding such smoke-box with water, except at certain parts, as described in reference to figs. 9, and 10. Thirdly,—the employment, in stationary boilers, of curved ends above the furnaces or flues, as described in reference to figs. 11, and 12. And, Lastly,—the use or employment, in one stationary engine or boiler, of any combination of the whole or any part of the improvements contained in this specification.—[*Inrolled June*, 1851.]

To JOHN GEDGE, *of Wellington-street, Strand, in the county of Middlesex, for improvements in the treatment of certain substances for the production of manures,—being a communication.*—[Sealed 17th December, 1851.]

THIS invention consists in improvements in the production of manures, which the inventor effects by certain operations on, or treatment of, stable litter or dung, by means of chemical compositions; so that, on the addition of common vegetable substances, hereafter mentioned, such compositions act thereon, and, while producing an increase in quantity, improve the quality of the manure.

The following are the proportions in which the chemical materials are used; but these proportions may be varied, if found necessary:—

	lbs.	oz.
Sulphate of ammonia	8	12
Sulphate of potash	16	10
Sulphate of soda	19	10
Sulphate of alumina	25	0
Sulphate [the patentee does not state of what]	25	0
Sulphuric acid	5	0
	100	0

This composition is dissolved in water, in the proportion of one pound of the composition to eleven gallons of water; and to prepare a ton of compost or manure, seventy-seven gallons of the solution are used, by sprinkling the same over

the litter while it is still in the stable: the litter might be operated upon in the open air; but in such case some of the ammonia would escape. The patentee remarks, that the litter should remain about from eight to fifteen [omitting to explain what these numbers refer to], where possible, in the stable, the flooring of which should be so formed as to retain the urine of the cattle thereon, to saturate the under strata of litter therewith, instead of allowing it to escape as usual. The litter or hot stable-dung, being in a proper state, and having been watered with the solution, should be carried out of the stable, and spread on the ground, in a layer about twelve inches deep, entirely over the space which the dung-hill is designed to occupy; and then straw, broom, leaves of trees, or any vegetable substances, are to be piled thereon, to the thickness of from three to four feet: if these substances are in a green state, and full of their own juices, they may be employed without preparation; but if dry, they are to be well saturated with water before being used. Upon the vegetable substances is placed another layer of dung, and upon the latter another layer of vegetable matters; and this operation is continued until all the litter is used, or the heap is as large as is required. The litter in the stable must be well watered at the time it is being used as directed, and also the vegetable matters, when dry: about eighty gallons of water will be required for one ton of compost.

The dung-heap being thus formed, fermentation rapidly takes place, and the ammonia is preserved, and does not escape. In about eight days the whole mass will attain a temperature of about 180°; and this heat, while it assists the progress of decomposition, destroys the germinating power of all the seeds of weeds, broom, heath, or other vegetable substances in the dung-heap. In from fifteen to twenty days the decomposition is complete, and the compost is ready for use.

When no vegetable matters are to be added to the litter, the sprinkling of the same with the solution will double its fertilizing properties. About 112 lbs. of the chemical composition, unmixed with dung, will be sufficient to manure an acre of land: the composition may be strewed over the land; or it may be mixed with about double its weight of earth or other well powdered substance, and thrown or sown over the land.

The patentee claims, First,—the making manure heaps, commonly called dung-hills, as above described, using the chemical combination as set forth for that purpose. Se-

condly,—the combination of chemical substances above stated to be used, either alone or mixed with earth or other pulverized substances, as described, for improving the productive quality of land.—[*Inrolled June,* 1852.]

To FREDERICK BOUSFIELD, *of Devonshire-place, Islington, Gent., for a new manufacture of manure.*—[Sealed 19th December, 1851.]

THE subject of this invention is the manufacture of manure from blood.

The patentee takes the blood of animals, usually of cattle, sheep, and pigs, from the slaughter-houses, and separates the fibrin therefrom by stirring it, as is well understood. He then puts the blood into evaporating pans or boilers, previously greased, to prevent the adhesion of the blood to the side of the same, and subjects the blood to artificial heat, sufficient to raise the temperature until evaporation becomes visible or sensible. A temperature of from 130° to 165° Fahr. is well suited for this purpose; though higher or lower degrees of heat may be employed; but the blood should not be allowed to approach the boiling point; as the higher temperatures render some parts of the blood insoluble when used as manure under ordinary circumstances. During this application of heat, the blood is to be frequently or continually stirred; and the heating and stirring are to be continued until the blood loses its liquid character and assumes a considerable degree of consistency. The mass is then removed from the evaporators and dried, by spreading it on the floor, or placing it on shelves, where it is stirred or raked, to prevent as much as possible the formation of lumps or masses before the required degree of dryness is attained. The evaporation or drying is to be continued until the blood is reduced to a powdery state. The apartment in which this part of the process is carried on should be heated by artificial means, so as to facilitate the evaporation of the watery particles; and this may also be facilitated by artificial currents of air. Much of the water remaining in the mass, after removal from the evaporators, may be discharged, by subjecting the mass to pressure; and then it may be further treated as already described; but, if pressure be used, the mass should be spread out soon after,—say within two hours after the pressing operation.

The substance obtained by treating blood, in the manner

above described, is suitable for manuring land, and may be used in the same way as guano and other artificial manures. The degree of dryness attained will depend upon the extent to which the evaporation is carried; but the patentee finds that the removal, by the above process, of from 65 to 75 per cent., by weight, of the liquid portion of the blood, produces a manure well adapted for general agricultural purposes.

The patentee claims, as his invention, the manufacture of manure from blood in the manner above described.—[*Inrolled June*, 1852.]

To William Smith, *of Kettering, in the county of Northampton, agricultural implement maker, for improvements in apparatus for cutting or breaking lump sugar and other vegetable substances.*—[Sealed 29th January, 1852.]

This invention has reference to certain improvements in apparatus designed to break or cut up into pieces loaf or lump sugar, and other vegetable substances, in an economical and expeditious manner.

In Plate VII., fig. 1, is a front elevation of the cutting apparatus, with the frame in which it is mounted in partial section; and fig. 2, is a sectional elevation, taken in the line 1, 2, of fig. 1. *a*, is a wooden framing, carrying, at its upper part, a table *b*, which forms the bed for a rectangular frame *c*, of cast-iron. To this frame *c*, which is secured to the table by screws, stationary knives or cutting edges *d*, *d*,* are bolted; and it is also furnished with a socket, which forms a guide for the stem *e*, of a moveable double knife *f*, *f*.* The fixed knives *d*, *d**, are set at right angles to each other; and the knife *d**, has a cutting edge projecting laterally from one side thereof.

The moveable double knife is shaped to correspond to this position of the knives; and from the part *f**, a cutting-edge projects laterally, corresponding to that on the knife *d**. Immediately below this knife *d**, an opening is made in the table for the discharge of the sugar (when cut into pieces of suitable size) into a trough or funnel *g*, from whence it falls into a box or other suitable receptacle *h*. The stem *e*, of the moveable knife is connected by a rod *i*, to a pin *j*, projecting from a crank-arm *j**, of an axle *k*, which carries the fly-wheel *l*, for steadying the motion of the machine. To the same crank-pin *j*, a treadle *m*, hinged to the side framing, is also connected by means of a rod *n*, and coupling chain. The axle *k*, works in a bearing *o*, bolted to a cross-bar of the

framing; and it is further supported by another cross-bar at the back of the machine.

When operating with this machine, the workman stands in front of the table, opposite the end of the knife *d*, and, while passing, with his left hand, the lump of sugar that is required to be cut up between the fixed and moveable knives *d*, and *f*, he, at the same time, works the treadle *m*, with his foot, which causes the axle *k*, to rotate, and communicate the required vertical reciprocating action to the knife *f*, for severing portions of the sugar from the lump. When he has, by means of these knives, broken up the sugar into lengths, he places them, piece by piece, between the knives *f**, and *d**, and continues the action of the treadle. To facilitate the placing of these pieces, so that they shall be cut into portions approaching to uniformity of size, a ledge or rest *p*, carried by the frame *c*, is provided, for supporting the sugar while under the action of the knives; and a stop-plate *q*, stands out from the back of the framing, for determining the distance that the sugar may be thrust beyond the line of the knives. By the descent of the knife *f**, upon the sugar placed beneath it, the sugar will be cut in two directions,—that is, the piece cut off by the parallel cutting-edges will be itself divided by the lateral cutting-edges already mentioned. The pieces will then fall into the trough or funnel *g*, and thence into the box below; and the dust will pass through a screen, with which the trough *g*, is fitted, into the compartment *g**. When it is required to change the length of traverse of the moveable knife, this may be effected by shifting the crank-pin *j*, into another hole of the connecting rod.

In cases where it may be found desirable to render the machine partially self-feeding, the patentee employs an endless apron, for carrying the sugar up to the second pair of knives. This is shewn in the detached view, fig. 3. The apron is supported by two rollers *r*, *r**; to the latter of which a ratchet-wheel *s*, is connected. Into the teeth of this wheel a click *t*, swinging from the stem *e*, takes,—it being borne up against the wheel by means of a spring, as shewn. Therefore, at every ascent of the knives, the ratchet-wheel will receive an axial motion, and thereby, through its roller *r**, cause the apron to travel forward and bring the sugar under the action of the knives.

From the foregoing description it will be readily understood, that the machinery is capable of modification, without departing from the nature of the invention. Thus, for example,— the capacity of the machine may be doubled, by affixing to

the traversing stem a knife, of the form of a cross, in plan view, and providing fixed knives, corresponding thereto, on the table of the machine. In this case, two attendants will be required for feeding the machine; but the same arrangement for driving the machine will suffice. Or, where greater resistance is required to be overcome than is compatible with the use of a knife mounted on a single stem, then it is proposed to fix the knife between two stems, which shall work in fixed guides, and be connected together beneath the table. It will also be obvious that other vegetable substances than lump sugar may be cut up by this machine.

The patentee claims, First,—the general arrangement of machinery or apparatus above described and shewn. Secondly,—mounting the moving knife or knives of such machinery on a stem, working in a fixed guide or socket, or on a pair of stems similarly fitted. Thirdly,—communicating the reciprocating motion of a treadle to the moveable knife or knives of such machinery by means of a jointed connection, of which a crank-pin is the centre of motion. And, Lastly,—the means above described and shewn, whereby the feeding-in of the material to be submitted to the action of the knives of such machinery is facilitated.—[*Inrolled July*, 1852.]

To BENJAMIN HINLEY, *of Birmingham, brass-founder, for improvements in the manufacture of castors.*—[Sealed 5th December, 1850.]

THIS invention consists in casting the horns of castors, or the parts to which the wheels or rollers are attached, on to axes, so formed, that, when enclosed in the cast metal, they will not draw out, but admit of the horns turning freely around them.

The axes are to be made with protuberances or grooves, or both; so that, when closed within the cast metal, they will not come out, but allow of the parts turning freely. The lower part of these axes may be wholly enclosed, or may project through the cast metal. They are preferred to be made of wrought-iron; but they may be formed of malleable cast-iron, or of other metal which will not unite with the cast metal of the horns, when the same are cast thereon. The axes are laid into the moulds used for casting the horns as cores, so that the lower parts thereof will be wholly or partly covered with the cast metal; and, in order to prevent the cast brass or other metal from cooling too tightly on the axes, the

latter are to be coated over, before being put into the moulds, with any suitable powder, such as black lead, which will retain its character, notwithstanding the heat of the melted metal. This powder is mixed with water, beer, or other fluid, and applied with a brush to those parts of the axes which are to be enclosed in the cast metal; and, when the mixture is dry, the axes are ready to be placed in the moulds. The castors, thus made, are dressed and finished in the usual way; after which they are warmed, and a small quantity of oil applied, so as to pass to the parts of the axes within the castings; and then the parts may be turned, and the castors are ready for use.

The patentee does not confine himself to the above details; but he claims the mode, above described, of constructing the axes, and casting thereon the horns or parts of castors which carry the wheels or rollers.—[*Inrolled June,* 1851.]

To FREDERICK BENJAMIN GEITHNER, *of Camden-street, Birmingham, for improvements in the manufacture of castors and legs of furniture.*—[Sealed 22nd November, 1851.]

THIS invention consists, firstly, in moulding or forming the rollers for castors of china or earthenware; and, secondly, in forming the legs of furniture of china or earthenware, when the same are constructed suitably for receiving castors.

In carrying out the first part of the invention, the patentee employs suitable moulds, according to the size and character of the rollers required; or he otherwise forms them in the same manner as other articles of china or earthenware are made. The rollers, when partially dry and in a proper state, are placed in a lathe, and turned or shaped in like manner to that in which other articles of china or earthenware are shaped from plastic clay; and such rollers are finished by fire and glazing in the ordinary way. Or, in place of forming the rollers of clay or other material in the plastic state, such material may be moulded into rollers by what is called the "dry process," in which the clay or material, when in a state of powder, is forced into metal moulds, and thereby very dense rollers of china or earthenware are produced. The rollers, whether moulded or formed from clay or other material in the plastic or dry state, may be ornamented by painting or otherwise. Instead of the rollers being made wholly of china or earthenware, they may be made partly of

china or earthenware and partly of metal. For instance,—the rollers may be cast or formed of metal of ordinary forms, but hollow at the sides, to receive discs of china, earthenware, or other material, which have holes through them for the passage of the pin or axis. These discs may be more or less ornamented; and they may be fixed in any suitable manner; but the patentee prefers to secure the same by turning the metal down over the edge of each disc: which may be readily done by placing a roller in the chuck of a lathe, and applying a smooth tool or burnisher to the edge, so as to press down the metal over the outer edge of the disc as the chuck is caused to revolve with the roller.

The second head of this invention consists, as before stated, in forming the legs of furniture of china or earthenware, in such manner as to have castors applied thereto. The legs are moulded to the desired forms of plastic clay; and, where the pattern will admit of it, they are turned in a lathe, when sufficiently dry; and they are afterwards finished and glazed in the ordinary manner. The legs may be ornamented by painting, or otherwise, if desired. The legs are formed hollow, so as to receive the long spindle or stem of the castor, which is formed with a screw-thread at the top, whereby it is affixed to the piece of furniture; and the leg is retained in its proper position upon the spindle by a collar or disc at the bottom and a nut and washer at the top.

The patentee claims, First,—the manufacturing of rollers for castors, by moulding them or forming them of plastic or dry materials, as above explained, and the manner of filling up the sides with suitable discs, as described. Secondly,—the forming of legs of furniture of china and earthenware, in such manner as to have castors combined therewith.—[*Inrolled May*, 1852.]

To Jean Benjamin Coquatrix, *of Lyons, in the Republic of France, merchant, for improved apparatus for lubricating machinery.*—[Sealed 27th January, 1852.]

This invention is designed, firstly, to economize the oil and other oleaginous substances used in the lubrication of bearings and other frictional surfaces of machinery; and, secondly, to insure a continuous and uniform supply of lubricating material to such frictional surfaces. These objects are effected by the employment of a conical or other suitably-shaped valve, which is capable of being readily adjusted with the greatest nicety to any required position, with respect to its seat, by

means of a screw on the stem of the valve, and a spring-catch, taking into a ring of notches provided for the purpose.

In Plate VII., fig. 1, shews the improved apparatus applied to a lubricating box,—the same being in partial vertical section, the better to exhibit the construction of the parts. *a*, is the box for containing the oleaginous matter. It is fitted with an exit-pipe *b*, the upper part of which is bored out to form the seat for the valve. Cast in one piece with this pipe is a neck *c*, which is tapped with a female screw, and is furnished with lateral passages *d*, *d*, to allow of the oil finding its way from the box down the pipe *b*. A conical valve *e*, fits the bore of the upper end of the pipe *b*; and it is sustained in an elevated position by means of a screw *f*, which is cut upon an enlarged diameter of its stem. To this stem a spring-catch *g*, is rivetted,—its object being, to take into a ring of notches or teeth, formed on the edge of the neck *c*.

The action of this apparatus is as follows:—Supposing it to be applied to a bearing, and the supply of oil to be cut off by the valve being depressed into its seat, and that it is required to continue the supply. This is effected by the workman, in attendance on the machine, turning the valve-stem: which action will cause the valve to rise from its seat and open a passage for the escape of the oil down the pipe *b*. In order to prevent the waste of the lubricating material, it has been found requisite to adjust the area of this passage to the supply of the oleaginous substance required for the bearing to which the apparatus is applied; and to enable the workman to effect this with precision, the spring-catch is employed. By the traverse of this catch over the ring of notches, as the valve-stem is turned by the attendant, an indication is afforded of the area that is opened for the escape of the oil. Thus it may be five, ten, twenty, or thirty notches that it is necessary for the spring to traverse over before a sufficient rise of the valve is effected to open the required area; and this having been once ascertained, the workman is at no loss to adjust his apparatus to suit the circumstances of the case.

It will be obvious, from the above description, that the form of the valve is immaterial, so long as it has a circular tapering periphery, and that the apparatus may be otherwise modified. An example of this is shewn at fig. 2, where, instead of the spring-catch being a traversing catch, it is affixed to the stationary neck *c*, and takes into notches in the stem,—the threaded part *f*, being, in this instance, fluted.

The patentee does not confine himself to the exact details shewn and described; but he claims, as his invention, the

manufacture of lubricating apparatus, wherein the valve, past which the lubricating material flows, is adjusted by the application of an axial motion; and, at the same time, the position of the rising valve, with respect to its seat, is indicated by means of a click or spring.—[*Inrolled July,* 1852.]

To ALFRED VINCENT NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of pigments or paints,—being a communication.*—[Sealed 29th January, 1852.]

IT has been discovered that natural rocks, such as serpentine, containing magnesia and oxide of iron, united to silicic acid, or composed in part of the hydrated silicates of magnesia and iron, may be partially decomposed by acids, so that the silica which they contain may be brought into a state in which it can combine with and give permanency and beauty to pigments, formed by uniting some coloring matter to that part of the mineral which remains undecomposed. This undecomposed part of the rock is termed by the inventor the basis, as it has, when dried, the mechanical and chemical qualities which are desired in pigments, and serves to give "body" or opacity to colors precipitated upon it.

Now this invention consists, first, in treating natural mineral substances, such as serpentine and the allied rocks, containing magnesia and the silicates of magnesia and iron, with any suitable acid, to form a basis for colors, to produce pigments or paints; and, secondly, in treating rocks of the class above specified with any suitable acid, in combination with certain coloring agents,—whether the acid be applied to the rock before, or simultaneously with, or after the application of the coloring agent or agents.

The mode of procedure which the inventor has practised with success, for the production of various colored pigments by precipitation, is as follows:—

For the production of blue.—The rock having been ground, or otherwise reduced to a fine powder, one hundred parts, by weight, are put into a suitable vat or vessel: the operator then adds 10 lbs. of prussiate of potash, dissolved in 40 lbs. of hot water, and thoroughly mixes the whole by stirring; after which, he makes a further addition of 25 lbs. of sulphuric acid, diluted with 25 lbs. of water, and thoroughly mixes by stirring, as before; and the whole soon becomes a fine blue pulpy mass. He then adds 50 lbs. or more of water, to dis-

solve the soluble salts; and, after this, the whole is permitted to rest for about thirty-six hours, or until the mass has settled. The liquid left on the top is then drawn off, leaving a fine blue pulpy mass, which is to be spread out and dried by the sun, or otherwise, at the discretion of the operator. A fine blue pigment is thus produced, which can be ground with oil, or otherwise mixed for use. The water which is drawn off contains sulphate of magnesia, and may be concentrated by heat and crystallized, to produce Epsom salts for the market.

For the production of compound colors, such as chrome-green, the inventor takes the blue, prepared as above described, after the soluble matter has been washed out, and adds thereto 15 lbs. of the acetate of lead (or an equivalent quantity of some other salt of lead), dissolved in 20 lbs. of pure water; and, when these have been mixed, he adds 15 lbs. of bichromate of potash, dissolved in 20 lbs. of water, and thoroughly mixes the whole. After the desired shade of green is produced, the coloring matter is to be washed and dried, as directed in the making of blue.

To produce a yellow, 100 lbs. of ground rock are thoroughly mixed with 50 lbs. of the acetate or an equivalent quantity of some other salt of lead, and 10 lbs. of muriatic or hydrochloric acid with 40 lbs. of water; then 50 lbs. of bichromate of potash, dissolved in 50 lbs. of water, are added; and, after the whole has been well mixed, the colored precipitate is washed and dried, as directed in making blue.

For the production of black.—The inventor takes one hundred parts of the pulverized rock, and adds thereto 50 lbs. of sulphuric or other acid, diluted in 50 lbs. of water. When these ingredients have been mixed, he adds 10 lbs. of logwood and 10 lbs. of nutgalls (or an equivalent weight of some other substance containing tannin): this must have been previously boiled in 40 lbs. of water, and strained. After thoroughly mixing the whole, he washes and dries the product, as directed in reference to the blue.

In conclusion, the patentee states, that he does not limit himself to the production of any particular color or shade of color; nor to the proportions of the ingredients to be used; nor to the order in which they are to be used; as all these may be changed or varied within the range of the present invention or discovery. He claims, First,—the method of preparing the basis above mentioned, by treating the natural silicates of magnesia and iron, or substances wholly or in part composed of those compounds, with an acid, so as to produce their partial decomposition, for the purpose above set forth; and, Secondly,—the production of a class of pigments or

paints, by uniting various coloring principles with a basis formed by the decomposition of the mineral serpentine, and the other allied rocks which contain magnesia and oxide of iron combined with silicic acid, or of mineral substances consisting in part of the silicates of magnesia and iron, as above set forth.—[*Inrolled July,* 1852.]

To ADOLPHUS OLIVER HARRIS, *of High Holborn, in the county of Middlesex, philosophical instrument maker, for improvements in barometers,—being a communication.*—[Sealed 19th December, 1850.]

THIS invention consists in an improved mode of constructing barometers, whereby the instrument is rendered more portable, more sensitive, and less liable to derangement than barometers of the ordinary construction.

A barometer, constructed according to this invention, is represented in Plate VII. The glass tube A, is about $\frac{1}{16}$th of an inch in diameter, and is bent so that its two limbs L, and R, may stand parallel to each other; at one end it terminates in a bulb C, which is only opened for a short time during the adjustment of the instrument, and is afterwards permanently closed; and at the other end of the tube there is formed a short-necked bulb B, which is kept permanently open, more or less, to the atmosphere. D, is a short conical branch tube, forming an extension upwards of the main tube A, from the throat of the bulb B, and terminating at about the centre of the bulb. Mercury, as pure as can be obtained, is first poured into the bulb B, through the neck or mouth E, (the other bulb C, being closed) till the surface of the same rises sufficiently above the mouth of the branch tube D, to exclude the atmospheric air, without the film of mercury over the mouth being heavy enough to descend into the tube. An aperture is now made at F, in the bottom of the bulb C; and carbonic oxide gas is forced into the bulb, through this aperture, until all the atmospheric air is expelled from the tube A, through the branch tube D. When this has been effected, the aperture F, is hermetically sealed; and then more mercury is poured in, through the neck E, until the compression of the gas in the upper part of the limb R, and bulb C, (at the ordinary temperature of the atmosphere) is such that the surface of the mercury in the limb R, stands at the point G; but if there is too much gas in the limb R, and bulb C, to admit of the mercury rising to the point G, by compression of the gas, the bulb must be re-opened, and a portion allowed to escape.

A plug of cane, wrapped round with leather, is then inserted into the neck E, of the bulb B,—the pores of the cane being left open at top, to admit of the free access of the atmospheric air to the interior of the bulb B.

The barometric tube A, with its bulbs, having been thus filled and adjusted, it is placed with a standard barometer beneath the receiver of an air-pump; and then, by subjecting the tube to different degrees of pressure, either by exhausting or condensing the air in the receiver, a scale of pressure H, is obtained, corresponding with the inches scale upon any standard barometer, only the divisions on the former scale are smaller; "because the barometric effect of the atmosphere on the surface of the mercury in the bulb B, is counteracted by the resistance of the gas in the bulb C." In order to apply the scale H, so obtained, another scale I, is formed, which is a measure (within certain limits) of the expansion or contraction of the gas in the limb R, and bulb C, due to any increase or decrease of temperature. The scale I, is formed by subjecting the tube A, to a similar process to that generally employed for marking off the scale of a common thermometer: that is to say, it is subjected to several different degrees of temperature along with a standard thermometer; and when the principal points, or the two extremes corresponding with those of the standard thermometer, have been marked upon the tube, it is fixed to the plate, and the space between the points on the tube laid down upon the plate, which is then divided into the proper number of degrees.

The barometer scale H, is made to slide up and down with its graduated edge against the side of the limb R; and it carries at top an index-pointer J, the length of which is determined in the following manner:—The improved barometer is placed at the side of a standard barometer, and the division of the scale H, corresponding to that on the standard barometer which indicates the true barometric state of the atmosphere at the time, is brought in a line with the surface of the mercury in the limb R; and then the pointer J, which is adjustable, is made to stand immediately over that degree upon the fixed scale I, corresponding to the degree of temperature indicated by the standard thermometer K, and is fixed in that position. The instrument is now ready for use. In all subsequent observations, to ascertain the weight of the atmosphere, the pointer J, is brought immediately over the graduation or degree upon the fixed scale I, corresponding to that indicated by the standard thermometer K; and then the graduation upon the sliding scale H, which is in a line with the surface of the mercury in the limb R, will indicate the

height of the column of mercury that is sustained at the time by the weight of the atmosphere in the common barometer.

The patentee states, that he prefers employing carbonic oxide gas to displace the atmospheric air from the tube A; but any other gas which, like it, has no affinity for mercury, may be used; or even air may be substituted, though not with advantage. The prolongation D, serves to prevent any air in the bulb B, from passing into the tube A, when the instrument is reversed.

The patentee claims the employment in barometers of a column of compressed gas, in combination with a column of mercury, in manner before described.—[*Inrolled June,* 1851.]

To WILLIAM COLE, *of Birkenhead, in the county of Chester, architect, and* ALFRED HOLT, *of Liverpool, in the county of Lancaster, civil engineer, for an improved method of preventing and removing the deposit of sand, mud, or silt in tidal rivers, in certain cases, and also in harbours, docks, basins, guts, or other channels, communicating with the sea through tidal rivers or otherwise,—the same being applicable, in certain cases, to other rivers or moving waters.*—[Sealed 24th March, 1852.]

THE improved method of preventing and removing the deposit of sand, mud, or silt, which forms the subject of this invention, consists in subjecting such deposit, or the water containing it, to the action of water forced or injected into it from below, so that the sand, mud, or silt shall be broken up or put into commotion, and held in suspension and carried off by the receding tide, or by an artificial stream or current, or by additional water acting so as to assist the momentum of the deposit or the water so acted on at the particular place.

The water to be employed for the above purpose may be derived from a reservoir at as great an elevation above the bed of the harbour, dock, dock-gut, or basin, to be cleansed, as circumstances may admit of or require; or it may be supplied under pressure by artificial means. At, or below, or near to the bed or bottom of the harbour, dock, dock-gut, or channel, which is liable to be silted up, the patentees place pipes, channels, or conduits of any suitable material, perforated in such manner as to allow of the water being applied in jets or streams in all directions to the deposit, or to the water containing the deposit; and such pipes or channels are connected by mains with a head of water, so that the water may be applied at such time or state of the tide as the particular locality may admit of or re-

quire. In ordinary tidal waters, it will be found desirable to lay on the head of water at half ebb tide and to keep it on until low water or after low water, in cases where additional water can be obtained for carrying away the deposit so disturbed. If there be no existing head of water or artificial reservoir available for the above purposes, the same object may be effected by force-pumps, or by retaining water under pressure.

Where inland rivers meet at or nearly at right angles, a delta of sand, mud, or silt, is usually formed at a short distance below the junction; but such delta may be removed or prevented from forming by means of water conveyed to or against it, as above described.

The patentees claim, the preventing and removing the deposit of silt, sand, and mud, by means of numerous shoots or jets of water, issuing under pressure into such deposit or the water containing such deposit in suspension, as above described.—[*Inrolled September*, 1852.]

Scientific Notices.

THE DEPARTMENT OF PRACTICAL ART *v.* THE SCHOOLS OF DESIGN.

The establishment of a Museum of Ornamental Art in the metropolis is a fact which is, we believe, destined to bring about important results. It will be remembered that, not many years ago, so low had the taste and artistic skill displayed in our manufactures become, that great and well-grounded alarm was caused by the prospect of our continental neighbours monopolising, in our own markets, all orders for goods of an ornamental or decorative character. At the instigation of some eminent manufacturers, who saw the importance, in a national point of view, of training a body of decorative artists to furnish designs for the various branches of manufacture susceptible of ornamentation, the subject was brought before parliament. After suitable enquiries had been set on foot, a government school of design was established in London; and subsequently, in the year 1841, a grant of £10,000 was made, to aid in the establishment of similar schools throughout the country. This progress towards a new state of things in art manufacture was naturally considered satisfactory; for, not only had the cause of the waning prosperity of the trade in fancy ribbons, lace, printed stuffs, &c., of British manufacture been discovered, but the pecuniary

means for remedying the evil had also been provided, and a prospect of a successful competition with our foreign rivals, in their own markets, seemed to have opened up. On referring to the report of the Council of the School of Design for the years 1842-3, to the Houses of Parliament, we find the following hopeful paragraph:—"Considering the brief period which has elapsed since the first establishment of the school, we cannot yet venture to expect any general effect of a favorable nature upon taste in the manufactures of this country. It is, however, we conceive, a point of some importance to have excited in the minds of that class of persons who are looking to employment as pattern designers, or as artisans in the various branches of ornamental art, a desire to acquire just principles of taste in ornament, and to avail themselves of the means which the School of Design offers for this purpose. This, we conceive, is satisfactorily shewn by the foregoing numerical statement." With an increasing number of pupils at Somerset House, and a systematized course of instruction under able masters, it might well be supposed, that the intention of the founders of the school would have been quickly realized, in London at least; for, what with the delivery of lectures on the various processes of design applicable to manufactures, in addition to the instruction of the masters, and the awarding of prizes for the best competing designs, nothing appeared to be wanting to render success inevitable. It nevertheless became apparent in the course of a short time that there was something defective in the system pursued; for, in spite of the combined exertions of the pupils and their instructors, the school failed to produce those striking results which had been anticipated: something had, unquestionably, been taught; but then it was not the thing for which the school was founded. On this head, Mr. Richardson, one of the masters, in a letter addressed to the Council, and bearing date October, 1846, said,—"We are at present a mere school of copyists, and not at all a school of design;" and, indeed, it was but too evident that the pupils had learned to draw; but, as to designing, of that they were wholly ignorant. On this point, Mr. Burchett, who, as a pupil, had gone through the course of study, and is now a master in this very school, wrote, "As a school of design it is an utter and complete failure. * * * Instead of any attempt being made to teach the *principles* of any style of ornament, the only principle acted upon is that of *continual copying.*" This state of things brought with it a great decrease in the number of the students, and there being, luckily, one master standing a little higher in office than the others, viz., the director, the cause of the failure fell upon his devoted head.

The complaints of masters and pupils eventually caused the appointment, in November, 1846, of a special committee of the Council, to consider and report to parliament on the state and management of the school. Before this committee the masters were severally examined, and it then came out, that no means whatever had been adopted for teaching design; but that the school of design had settled down into an inferior kind of drawing school, in which the average attendance of students was but eleven months,—although the director declared his belief that five years of study were requisite to enable a pupil (supposing him to possess naturally a taste for design) to design good patterns for a calico printer or paper stainer, having reference both to form and color. This examination of the masters also brought out the astounding fact, that no principles of design were recognized in the school; and that the line of demarcation between decorative art and fine art was unknown: indeed, it was even doubted by the director whether the art of design *could* be imparted. But, besides the facts elicited, many valuable suggestions were obtained by this enquiry, and the result was, an able Report, adopting some of these suggestions, and making out more clearly the course of instruction that should be pursued for the future. On this head, the Report of the Council says,—"We must state our conviction that it is essential, that, as preliminary to the teaching of the principles and practice of ornamental design, a power of exactly imitating the form and color of objects should be imparted to the students." To meet the complaint, that the principles of ornament, and the practice of original design, as applicable to the manufactures, are not efficiently taught, the Report advocates the carrying into effect of "a systematic and complete course of instruction." And, further, it proceeds to say, that "this should include lectures upon the several subjects of instruction, copiously illustrated by examples; that a course of reading of appropriate books should be pointed out and encouraged; that select examples of ornamental art, including actual patterns of manufactures, should be analyzed by the lecturers and the masters, in order to exhibit to the students *the principles* on which they are constructed, and to explain to them, as may be possible, the causes of beauty in such examples; so as to lead them gradually to the exercise of the inventive faculty, in forming for themselves new combinations from nature and art, applicable to ornamental manufactures and decoration." Nothing could be better than the course thus laid down; but, alas! so obstinate is poor human nature, that a similar line had already been marked out without any beneficial result. It was, we

are informed, the especial duty of the director to deliver lectures upon the history, principles, and styles of ornament; and especially to superintend the class of original design, with the view of giving ample instructions in the principles and characteristics of ornament. Where, then, was the use of merely repeating the instructions? The proof of the inefficiency of such a proceeding, to meet the evil complained of, has, we suppose, at last shewn itself; for now we find this branch of instruction inaugurated under new auspices, the old dynasty having been deposed and a new one erected, which, in order to blot out all remembrance of past failures, has swept away the ancient name of the institution over which it presides, and terms it the "Department of Practical Art." The first public move which the heads of this department have made is, in our opinion, a very judicious one; for it was but too apparent, under the old *regime*, that, whatever of individual talent the school possessed in its masters, and certainly the artistic ability of the greater number was undoubted, there was very little agreement as to the principles involved in the designing and application of ornament, and the mode in which a knowledge of these principles should be imparted. The establishment, however, of a Museum of Decorative Art productions is, in our opinion, eminently calculated to remedy this inconvenience; as the very collecting of the specimens which are to be set up as authorities for the students, for manufacturers, and the public, could not but elicit from the parties responsible for the contents of the museum, a recognition of the true principles of decoration, so far as they were enabled to detect them. We know not to whom the credit of the idea of founding this museum is due; but, for the carrying of it out, there is no doubt that the public is chiefly indebted to Earl Granville, who, in his capacity of Vice-President of the Board of Trade, recommended a grant from the Treasury of £5,000 for the purchase of some choice specimens from the Great Exhibition; and thus a nucleus was formed for what may hereafter become a truly national exhibition. It may appear strange that—while the exertions hitherto made to advance the art of ornamental design have been rightly directed to improve the taste of designers and manufacturers, and so render their labors more acceptable to a critical public, whose desire for chaste designs could only be satisfied by foreign artists—the public itself should be more wanting in judgment to appreciate meritorious ornamentation than the contemned designers and pattern draughtsmen themselves. Yet such is the fact, as the vast importation of foreign absurdities in the way of decorations and ornaments too plainly testify. Upon points of this nature,

wherein the masses are only to be taught through the organ of vision (as the exercise of their reason would be considered too great a labor), a museum of judiciously-selected specimens of art manufactures, rejoicing, moreover, under government patronage, is, of all things, the best calculated to instruct; for while it must tend to bring about among the more thoughtful a unity of opinion on the subject of decoration, it will afford to others the means of acquiring an intuitive perception of what is really meritorious—no matter whether it be the work of the semi-savage—as well as a keen sense of what is meretricious, although it may have come from a royal manufactory, renowned for centuries for its unrivalled taste and skill. If these should be the results of the establishment of the museum, no slight honor will belong to the originator of the project; for if we count up the many branches of manufactures susceptible of ornamentation, and then consider to what extent the marketable value of any one article, by its judicious decoration, may be increased beyond the extra cost of the labor which the application of the ornament involves, we shall see that the annual net returns of the productive industry of the country will be vastly greater than at present, and that without any corresponding drawback in the shape of overworking, or hazardous mercantile speculations. The project is evidently no new one, for we find in a communication addressed by Mr. Townsend (one of the masters of the School of Design) to the Council, in 1846, the following remarks, which are an echo of what has been carried out:—"Upon the establishment of a Museum, the more stress has been laid, because it is evident that the elevation of the public taste should invariably go hand in hand with the studies of those who are to minister to it. At whatever rank we may estimate the specialities of French taste, it is a well-recognised fact, that its influence so pervades all classes of the people, that even the flitting fashions of a day must, in order to be successful, aim at accomplishing not only something that is new, but something that appeals to their sense of the beautiful. Hence is manifest the vast importance, commercially as well as æsthetically, of cultivating the perceptions of the whole community, since, with every fresh inroad of the love of art on large sections of the people, there arises a new series of wants, which it will be the business of the designer to supply. General admission, therefore, on certain fixed days, to such a museum, together with an exhibition of the works of the students—periodically opened and sufficiently prolonged—would succeed, by exciting curiosity in all—serious examination and true pleasure in many; and these would be the means of conferring on the Institution that which it now manifestly lacks—

a due hold on the comprehension and unreserved confidence of the public." And, further, the writer says, "Valuable information might also be embodied in a descriptive catalogue:" this is also a point that has been carefully attended to by the new management; for not only do critical remarks follow the ordinary catalogue notices of the chief specimens; but some valuable extracts, from the writings of authorities on decorative art, are scattered over the work, or thrown together in an appendix. A small collection has also been made of subjects—no doubt at the suggestion of Mr. Owen Jones—illustrative of *false principles* in decoration; and these false principles are distinctly pointed out in the catalogue. This must have occasioned considerable embarassment to the compilers of the museum, as many choice and costly specimens, which are not included in the condemned ward, may be considered as fairly entitled to a place in that unenviable locality. We ought, however, in consideration of the difficulty of the undertaking, to receive, with all charitableness, the explanation of this seeming incongruity, offered us in the introduction to the catalogue. On this point, the managers, Mr. Henry Cole, Mr. Redgrave, R.A., and Mr. Owen Jones, offer the following remarks:—"Most of the examples, indeed, in the opinion of the Committee, have a mixed character. Some, like most of those from the East, illustrate correct principles of ornament, but are of rude workmanship; whilst others, chiefly European specimens, shew superior skill in workmanship, but are often defective in the principles of their design. Thus, the Paris shawl, by Duché Ainé, was rewarded by the jurors as a triumph of manufacture; but its direct imitations of natural objects appear to the Committee to be of very inferior design to the ruder scarfs of Tunis, or the Kimkhols of Ahmedabad." But it must not be concluded that, because a museum has been founded, which will eventually afford a test for the true principles of decoration, the schools of design must of necessity succeed under the new management; on the contrary, we see the elements of future broils already in the horizon; and it depends greatly upon the prudence and firmness of those most interested in the artistic education of our artisans, whether or no the ominous cloud will disperse or grow into a storm cloud. At the head of the department is a gentleman who, whatever may be his deficiencies in point of artistic knowledge, has this important qualification—untiring energy. It may therefore be concluded, that, whatever crotchets he may advocate, it will not be his fault if they are not carried out. Moreover, he is not without considerable influence, and having raised himself to his position by his indomitable perseverance, will doubtless manage to retain it. This gentleman is, or

rather was, in *propria personæ*, the Executive Committee of the Great Exhibition; he has for some time been, and may still be looked upon as, the Council of the Society of Arts,—which Society, although it has been invidiously designated as "all feathers," holds no unimportant position in the eyes of the admiring public. We have said thus much of the man, as an introduction to his opinions on the system which we expect to see carried out under his direction. At a meeting, held at the Mechanics' Institution, Bradford, on the 2nd of February last, to consider the best means of establishing an "Art-manufactures' Institute," Mr. Cole is reported to have delivered himself of the following fling at the present mode of teaching drawing:—"They found, down stairs, the manifestation of a desire to have a museum; they had figures of Venus and other castings; *but he took leave to doubt whether they had any such practical bearing on their interests in the manufacture of damask and other fabrics as some other things had.* (Hear hear.) Further, he knew the manufacturers sent to France and the Rhine for patterns of manufactures going on there, in order to get all the knowledge they could of their foreign competitors; still enough was not done to stimulate design at home. In order to do this, they must have something else than casts of Venus and ancient architectural models, such as they had down stairs. (Laughter.)" From this extract we gather that figure drawing is to be discountenanced in the schools of design; and this view is confirmed by his recommending plants as subjects for study; in allusion to which, he remarked, that "there was nothing half so fanciful in having a greenhouse for art education, as in having those statues down stairs;" and again the mention of the statues called for the response of "Hear, hear, and laughter." Now, it must be manifest to any one at all acquainted with the arts, that nothing is better calculated to induce a laxity and want of precision in drawing than copying flowers and fruits. Does not every-day experience shew that young ladies resort to this milk and water department of art because it is so easy? and yet this is the system which is to give us designers, who shall rival artistic France! It is unnecessary to appeal to the experience of artists themselves, to support our objection to Mr. Coles' project, or we might quote many passages in the blue book to which we have already referred; we cannot, however, refrain from stating, that the late Mr. Haydon publicly attributed the extraordinary facility possessed by Mr. Lance, in the delineation of floral and still life subjects, to the attention he had given to the drawing of the human figure. That the schools of design have hitherto borne but scanty fruit is undeniable; but, if this scheme of the general superintendent

of the Department of Practical Art is to be carried out, we are satisfied that a total failure will be inevitable. We know not what steps, or even if any have yet been made, towards the attainment of this barren result; but if the drawing of the human figure—which, of all subjects, renders any inaccuracy easy of detection by the pupil—is to be abandoned, it will not be long before manufacturers will wish Mr. Cole back into his former obscurity, rejoicing in the name and deeds of Felix Summerley, or amusing himself with the harmless occupation of writing and printing, in the name of the Society of Arts, nonsensical "Reports on Patent Law Reform," or establishing "Public Waiting Rooms," under the nominal sanction of that august body, or doing the hundred other important nothings for which his abilities and untiring assiduity have evidently fitted him.

RULES AND REGULATIONS ISSUED UNDER THE NEW PATENT LAW AMENDMENT ACT.

We are now enabled to present our readers with the regulations issued by the Commissioners under the new Patent Law, in anticipation of the first of October, when the law comes into operation. It will be seen that many of the rules are but an echo of the Act, and that the orders with respect to the fees to be paid in the case of opposition to the grant of letters patent, and of applications for the allowance of disclaimers, and memoranda of alterations to specifications, and for the grant of the same, confirm the practice which has heretofore obtained. There is, however, one important novelty set forth, in relation to the deposit of drawings for the use of the Commissioners. In the last number of our journal, we called attention to this point, and shewed the necessity of providing two fac-simile copies of the specification drawings, in addition to those required by the Act; and, at the same time, we pointed out the reasonableness of putting the expense of the deposit of those drawings upon the patentee. It now appears that the Commissioners have thought it desirable to insist upon the deposit of three extra drawings, viz., one for inrolment in Edinburgh, one for Dublin, and the third for the use of the engraver to whom the publication of the specification drawings is to be entrusted. Such being the case, the Commissioners have taken upon themselves the duty of repaying the patentee the expenses to which he has been put for providing these extra copies. It is at present doubtful what may be the income of the office; but we feel assured that this generous provision of the Commissioners will have to be recalled, if the office is intended to pay its own

expenses. Further than this, we see no occasion whatever for the third extra copy; and we look forward, therefore, with confidence, to an alteration in the rules and orders as far as this point is concerned. There are many matters of practice that still require to be settled; but these cannot be satisfactorily disposed of until the law is in actual operation.

First Set of Rules and Regulations under the Act 15 *and* 16 *Vict. c,* 83, *for the passing of Letters Patent for Inventions from and after the* 1*st day of October next.*

By the Right Honorable Edward Burtenshaw Lord St. Leonard's, Lord High Chancellor of Great Britain; the Right Honorable Sir John Romilly, Master of the Rolls; Sir Frederic Thesiger, Her Majesty's Attorney-General; and Sir Fitzroy Kelly, Her Majesty's Solicitor-General; being four of the Commissioners of Patents for Inventions under the said Act.

WHEREAS a commodious office is forthwith intended to be provided by the Crown as the Great Seal Patent Office; and the Commissioners of Her Majesty's Treasury have, under the powers of the said Act, appointed such office as the office also for the purposes of the said Act.

All petitions for the grant of letters patent, and all declarations and provisional specifications, shall be left at the said Commissioners' office, and shall be respectively written upon sheets of paper of twelve inches in length by eight inches and a half in breadth, leaving a margin of one inch and a half on each side of each page, in order that they may be bound in the books to be kept in the said office.

Every provisional protection of an invention allowed by the law officer shall be forthwith advertised in the London Gazette, and the advertisement shall set forth the name and address of the petitioner, the title of his invention, and the date of the application.

Every invention protected by reason of the deposit of a complete specification shall be forthwith advertised in the London Gazette, and the advertisement shall set forth the name and address of the petitioner, the title of the invention, the date of the application, and that a complete specification has been deposited.

Where a petitioner applying for letters patent after provisional protection, or after deposit of a complete specification, shall give notice, in writing, at the office of the Commissioners of his intention to proceed with his application for letters patent, the same shall forthwith be advertised in the London Gazette, and the advertisement shall set forth the name and address of the petitioner, and the title of his invention; and that any persons having an interest in opposing such application are to be at liberty to leave particulars, in writing, of their objections to the said application, at the office of the Commissioners, within twenty-one days after the date of the Gazette in which such notice is issued.

The charge for office or other copies of documents in the office of the Commissioners shall be at the rate of two-pence for every ninety words.

By the Right Honorable Edward Burtenshaw Lord St. Leonard's, Lord High Chancellor of Great Britain; and the Right Honorable Sir John Romilly, Master of the Rolls.

ORDERED, That there shall be paid to the law officers and to their clerks the following fees:—

By the person opposing a Grant of Letters Patent.

	£.	s.	d.
To the law officer	2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the petitioner on the hearing of the Case of Opposition.

To the law officer	2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the petitioner for the hearing, previous to the Fiat of the Law Officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

To the law officer	2	12	6
To his clerk	0	12	6

By the person opposing the allowance of Disclaimer or Memorandum of Alteration, on the hearing of the Case of Opposition.

To the law officer	2	12	6
To his clerk	0	12	6

By the petitioner for the Fiat of the Law Officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

To the law officer	3	3	0
To his clerk	0	12	6

Ordered by the Right Honorable Edward Burtenshaw Lord St. Leonard's, Lord High Chancellor of Great Britain.

All specifications in pursuance of the conditions of letters patent, and all complete specifications accompanying petitions and declarations before grant of letters patent, shall be filed in the Great Seal Patent Office.

All such specifications shall be respectively written upon both sides of a sheet or sheets of parchment, each page being of the size of 18 inches in length by 12 inches in breadth, leaving a margin of 1½ inch on each side of each page, in order that they may be bound in the books to be kept in the said office; but the drawings accompanying such specifications, if any, may be made upon larger sheets of parchment than of the size of 18 inches by 12 inches, leaving a margin of 1½ inch, as aforesaid.

The charge for office or other copies of documents in the Great Seal Patent Office shall be at the rate of 2*d.* for every ninety words.

Notice.—The Act directs that, in case reference is made to drawings in any specification deposited or filed under the Act, an extra copy of such drawings shall be left with such specification. The petitioner or patentee is required to leave at the office, on filing his specification, four extra copies of the drawings, if any—one copy to be transmitted by the Commissioners, with the office copy of the specification, to the Enrolment Office in Dublin, one other to the Chancery Office in Edinburgh, as directed by the Act, and the third copy for the use of the Queen's Printer. The petitioner or patentee will be repaid at the office the reasonable charges made by his draftsman for the three extra copies hereby required.

REMARKS ON VENTILATION AND THE WARMING OF ROOMS.

By S. Webber, M.D., Charlestown, N. H.

The object of the present paper is to set forth fairly the merits of different modes of warming, in connection with preserving purity of the air, with economy of fuel, and also of preserving purity of the air in assemblages of people, where warmth is not required, or when it becomes too great.

Supposing a room to be so tight, by means of well and accurately fitted doors and windows, that no noticeable quantity of external air can enter by crevices, probably the most pleasant way of warming it in cold weather will be, to have an open fire-place, adapted for either wood or coal (as either kind of fuel may be most convenient), with a hollow hearth, sides, and back; into which hollows air shall be admitted by a pipe leading from the open air outside of the building; and which, when warmed by contact with the heated sides of the fire-place, in contact, or nearly so, with the fire, shall pass out into the room by openings in front of the jambs: which openings may be more or less, or wholly closed, at pleasure, by some contrivance like a sliding lid or valve. In this case, the air for the support of the fire will be furnished from the lower part of the room, and consists of the coldest part of the air in the room, and that most contaminated with carbonic acid gas. This, by the constant ascent of the warm air from the supply openings to the upper part of the room, will be constantly and equably pressed towards the only mode of escape for it, the opening of the fire-place into the chimney above; and it will, at the same time, be drawn thither by the suction occasioned by the rarefaction and ascent of the air in the chimney from the action of the fire. The air of the room will thus be perpetually renewed; and the renewal will be made with warm pure airs. Unless the room be overcrowded, overlighted, or over heated, no other ventilator will be wanted for preserving

such a degree of purity of the air as is necessary for comfort and health.

Some little attention, however, is requisite to the material of the fire-place. If it be made of iron, as has been sometimes the case, when the fire is strong, the iron, if in immediate contact with it, becomes greatly heated, perhaps red-hot; and, in this condition, it will readily decompose some of the air coming in contact with it, depriving it of its oxygen, and sending into the room, not pure warm air, but air unduly charged with nitrogen. Some other substance, which, when heated, will not thus act upon the air, seems preferable. Iron will do well enough for the bottom or hearth, if a bed of ashes be permitted customarily to cover it, sufficient to prevent its becoming unduly heated. The sides and back may be built in the common way of brick,—the only objection being, that this material is a slow conductor of heat, and considerable time must elapse, after the kindling of the fire, before any perceptible effect can be noticed on the air contained in the hollows. Brick, moreover, in houses of the better class, will hardly be considered handsome enough. A fire-place constructed of slabs of soapstone will be better in both of these points, though it is by no means so good a conductor of heat as iron, while it is a better one than brick. It may, however, be observed, that by way of compensation, though the air in the hollows will not be warmed so quickly by these two substances, yet that it will continue to be warmed longer after the fire is gone out; as they seem to have a much greater capacity for caloric than iron, and, under equal circumstances, will continue to impart it long after iron has become cold.

The porcelain, of which stoves are frequently constructed in France and Germany, might probably be applied, with advantage, to the construction of fire-places of this kind, if it could be readily obtained, where soapstone was not easily to be had. For the greater economy of fuel, the upper part of the back of the fire-place should be brought forward, so as to leave the throat of the chimney as narrow as possible, consistently with a fair and free escape of the smoke; and it might be provided with a slide under the mantel-bar, for the purpose of rendering the opening wider or narrower, as the state of the fire and the chimney may require.

Another point to be carefully attended to, is the character of the air brought in by the supply pipe to be warmed and passed into the room. This should be brought from the outside of the house, in some place where it may be presumed to have at least a fair average degree of purity, where the currents of the atmosphere have a free circulation, and, if possible, where sunshine penetrates during some portion of the day. To bring it from under the house merely, or from a cellar, from the neighbourhood of a drain, or from a damp close, where wind and sunshine seldom or never penetrate, is only to change one poison for another.

But this mode of warming and ventilating rooms when artificial warmth is required, however excellent in some respects, is

yet deficient in one great point—economy. However carefully a chimney and fire-place may be constructed, with an open fire, whether of wood burning on the hearth or of coal burning in a grate, there must unavoidably be a great waste of caloric, as a large portion of it passes directly from the fire into the chimney, and out into the atmosphere, heating the chimney as it passes up, and thus increasing the strength of the draft by which it is raised. Hence a much greater consumption of fuel is necessary for giving the requisite warmth to a room; and moreover, as the bulk of the caloric that is sent into the room is thrown into it by radiation from one side or end, it is difficult to warm the room so equably, that a near approach to the fire shall not be very uncomfortable from heat, when the remote parts of it are not so from cold, whenever the temperature of the atmosphere abroad is very low.

Where not one or two rooms merely, but a considerable portion of a house, passages and all, are to be warmed,—as modern ideas of comfort in many cases require,—the expense of fuel in our long and severe winters becomes a matter of considerable importance to those not abounding in wealth; as also does the care necessary for attending to so many fires. Hence has arisen the plan of having one large general fire in the basement or cellar: this fire is placed in a furnace arranged for heating a constantly renewed supply of fresh air, which is then distributed by pipes to the different rooms and passages which it is wished to warm. If this plan be carried into effect in an otherwise unexceptionable manner, it is probable, that though the first outlay be considerable, yet that, as regards the regular consumption of fuel for obtaining a given degree of warmth in the house, and also as to the amount of labor necessary, there may be much sound economy in the plan. But that the arrangements generally made are unexceptionable, or even not in a considerable degree otherwise, is very doubtful, to say the least. As generally constructed, the part of the furnace containing the fire, and through which the caloric passes to be communicated to the air admitted between the inner and outer walls, is made of iron; and as the fire within is large and often fierce, it must, when much warmth is required, be often very intensely heated, so as not only to decompose the air, as before stated, but even the watery vapour contained in it, and thus throw into the rooms not only air with an undue portion of nitrogen, but unduly dry, and still more unfit for breathing from being contaminated with hydrogen. Furthermore, when there is, as is almost always the case, any fine organic dust floating in the atmosphere, such of this as comes in contact with the iron, if that should be at a red heat, will, in part at least, be burned, and the product of its combustion go still farther to pollute the air. The volume of gaseous matter that may be produced by the burning of a very minute quantity of organic dust, is vastly more considerable than those not familiar with the subject will readily believe. In short, all the cautions given under the head of hollow air-heating fire-places must be observed with greatly increased strict-

ness in the management of furnaces for warming houses. The amount of precaution required increases with the size and intensity of the fire that is used. For regulating the purity of the air in rooms thus warmed, while still the full supply of warmth is desired, there should be, near the level of the floor, a good sized ventilating aperture, communicating with the flue of a chimney, or with an up-draft pipe.

Open stoves, as they are called, are but modifications of fire-places, more or less detached from the chimney. They provide well for one part of the necessary ventilation—the means of discharging the impure air through the draft into the chimney; but they are usually entirely deficient in the other essential part—the means of warming and throwing into the room a supply of fresh air to take the place of that which thus passes out. For this the room has to depend upon the in-draft of cold air through the crevices of doors and windows; and if these be well closed, such stoves smoke intolerably, and the air of the room soon becomes otherwise very impure. This may be obviated by making such stoves double, and admitting the air into the hollow under the hearth by a pipe leading from the external air beneath the floor. This air, well warmed by passing through the hollows of the back and sides, may be permitted to pass through a register in the upper plate of the top. The same remarks as to the materials and degree of heat, which were given under the head of fire-places, are appropriate to these open stoves. They are decidedly more economical than fire-places in the base of the chimney, when they are completely detached from the walls of an apartment; since all the caloric communicated by the enclosed air to the outer plates of the stove is radiated by them into the room, forming no inconsiderable addition to its warmth.

Still this kind of stove requires a large, free, and pretty direct passage for carrying off the smoke of the fire; and this also permits the escape of a large portion of the caloric produced by it; so that they are decidedly less economical than close stoves, where only a small opening is left for the in-draft of the air from the room to the fire, to maintain its active combustion: through which small opening, the current is so strong, that a much less sized smoke pipe is required; and this may be much more tortuous in its approach to the chimney flue,—thus carrying from the stove less of the caloric, and permitting a considerable part of what it does receive to escape by radiation from its sides. If a comparatively large stove of this kind be used, with a good length of funnel, making, if possible, several turns up and down, before finally entering the chimney or passing into the air, as great an economy of fuel will be obtained as is probably desirable; for some amount of caloric must pass into the chimney, both that this may perform its office well, and for its preservation. As commonly used, the two great defects of this kind of stove are, that the aperture for the supply of air to the fire is hardly large enough to carry off the foul air from a room, if occupied by sev-

eral persons, and if two or three lights are burning in it; and that no provision is made for the renovation of the air by introducing warm fresh air. The first of these is easily remedied by a ventilating aperture on a low level, communicating with the chimney flue, to be used more or less, as occasion may require; the second may be corrected by making the stove double, in the same way as was mentioned for open stoves. Stoves of this kind, made of soapstone or porcelain, are preferable to those made of iron; but, if the latter be large and but moderately heated, no essential evil will arise from the material. When the polish, with which it is customary to coat iron stoves, readily gets brown or ash colored, it is evidence that the stove is far too highly heated. Double close stoves, made of soapstone, have lately come into partial use; and their performance is, in all respects, very unexceptionable.

Air-tight stoves are excellent as to economy of fuel; but this is their only merit. They impart warmth in the highest possible degree; but in themselves do nothing for a change of air,—neither carrying off any noticeable quantity of foul air, nor supplying any fresh warm air. These defects are the same with those of close stoves, but in the highest degree; and they may be remedied in the same way;—the ventilating opening into the chimney should however be larger than in a common close stove. The very perfection, however, with which they impart their caloric to the room is a serious defect; for if a chimney is used only with one or more of these stoves, there is not sufficient warmth imparted to it in very cold weather, to prevent the pyroligneous acid generated in the combustion of the fuel, and passing in vapour by the edges of the *damper*, from being condensed against the inside of the chimney, where it penetrates the mortar with which the bricks are laid, and, acting upon the lime, destroys the tenacity of the cement, and passes through it into the rooms. An instance of this kind fell under the writer's observation. The chimney, in this case, had two flues,—one from the ground floor and one from the chamber above. Both were provided with air-tight stoves, which were managed with rigour, according to the directions of the inventor. In the course of the first winter the pyroligneous acid began to shew itself in the chamber, oozing through the plastering on the sides of the chimney, where it was laid upon the bricks, and running in streams down to the floor. The same thing took place, even more copiously, in the loft above the chamber; and the fluid that ran down there spread in puddles over the ceiling of the chamber which intercepted it, and, before spring, made its way through the plaster of this ceiling in large patches, dripping copiously in various places, defacing and spoiling the carpets and furniture below, and rendering it necessary to set a number of vessels on the floor to catch the dropping fluid, and prevent it from effecting the same destruction in the parlor below, which, indeed, with all precautions that were taken, did not entirely escape. The chamber was rendered uninhabitable, and all that

part of the house was troubled with "a most ancient and fish-like smell." The use of the stoves as *air-tights* had to be entirely given up; and it was found necessary to rebuild the chimney and new plaster the ceiling of the rooms. At the suggestion of the writer the chimney was built double,—a space of two inches being left between the inner and outer walls, occasional bricks passing through this as binders, and the hollows being closed over at the top. The warm and impure air passed into these hollows, through the ventilating opening of the rooms, and issued into the internal flue by lateral openings near the top. Advice at the same time was given, to let the heat pass freely into the chimney occasionally, so as to keep the bricks of the internal wall sufficiently warm to prevent the condensation of the pyroligneous vapour. These precautions, for two or three years, were found effectual. After that time a furnace was used.

The use of steam-pipes, as a means of warming dwelling-houses, has been attempted, but has found so little favor, that it is hardly worth while to say any thing about them. They are costly and troublesome, and have in themselves no means of changing the air. In establishments where steam is generated in large quantities for other purposes, it may be profitable to employ waste or spare steam for the purpose of warming such portions of the building as it can readily be conveyed to without much expense,—the necessary purification of the air being otherwise provided for.

Such are the principal modes that have been employed for imparting warmth to dwelling-houses, with their advantages and disadvantages, both as to warming, and as to preserving the purity of the air while diffusing heat, with the means necessary for so doing while the increase or maintenance of warmth is desirable. But this warmth, so artificially procured, may become excessive. From too large a fire, the presence of too many persons in a room where the fire is, and the burning of numerous lights, the air may become too warm and impure, and additional ventilation, with cooler air, may be required. In this case, a ventilating aperture in the upper part of the chimney is wanted, to permit the escape of the warm air from the upper part of the room, and with it such of the gaseous exhalations, engendered in such cases, as are of a light specific gravity. Rooms therefore used for the reception of company, where any considerable number of persons are likely to be occasionally assembled, should always be provided with a high ventilator. It may not be always convenient to put out the fire, or materially to lessen the number of lights; though the ingress of warm air from the supply-pipes may be stopped, and that already in may be suffered to escape through the upper ventilator. That it may do this, however, other air must be admitted. Opening doors and windows, one or more, as the need may be, will readily do this; but unpleasant and excessive drafts are thus created, oftentimes more immediately prejudicial to health, to those fully exposed to them, than a slower cooling and purification of the air by means of the upper ventila-

tion only. A proper ventilating opening or openings, for the admission of fresh cool air, will be required. These should not be on the floor; as the cool air would thus be thrown principally about the feet and ankles, where least needed and most prejudicial; and whence it would ascend slowly to the level of the mouth and nostrils, much warmed in its ascent, and much loaded with emanations from the body. It should be admitted at a high level near the ceiling, at some distance from the upper warm-air ventilator, and, if possible, on the opposite side of the room, so as to diffuse itself to some distance in that higher portion,—driving the warm air before it to its appropriate place of escape, and descending as it moves forward,—mixing with, condensing, and quickly bearing down with it to the lower part of the room, the impurities it might meet with,—conveying grateful refreshment to the lungs, and checking the ascent of impurities from below the mouth and nostrils. The very coolness applied to the head is one of the best means of preventing the bad effects of the inhalation of air impure from an undue mixture of carbonic acid; as this part of the system is the first almost to manifest the effects of blood not duly purified in the lungs.

The common mode of admitting air into too warm a room, by letting down the upper sash of a window, where it can be done, in preference to raising the lower, is founded upon this principle, and is perfectly correct. The mode, however, is somewhat defective; as the air is admitted in too large a body, and with too strong a current, except for excessive cases; and, by producing too sudden a check to perspiration, and to the secretions of the mucous membranes of the air-passages, it is apt to produce inflammatory affections of the head and throat. Were it to pass through a sheet of wire-gauze or perforated plate of thin metal, its force and intensity would be much lessened; as it would be divided into numerous minute currents, and, instead of descending like a cataract, would fall quietly, like spray or mist, mixing intimately with the warm air and gently cooling it, and refreshing and cooling, without chilling, the heads, necks, and air-passages of the persons in the room. Were a space of a foot in depth in the upper part of one or two windows with a moveable upper sash thus provided (and this might easily be done, and so as even to be ornamental), no better ventilators for supplying cool fresh air to an over-heated room need be wished for.

This ventilator, with the internal one into the upper part of the chimney, will be found very serviceable at times when a fire is not needed, and also when from the number of persons and lights a room becomes too warm, while the weather is still so cool that the external air cannot be admitted freely by open windows. Indeed it seems as if, in a room provided with these different ventilators and the means of warming recommended, there would be no great difficulty to be encountered in keeping the desirable degree of warmth and purity of the air in any but hot and sultry weather, when of course the temperature of the external air must

in some degree limit the amount of coolness to be obtained by ventilation.

It should be remarked, that the air, heated by a stove, is not the more dry for heating, but only has its capacity for dissolving vapour increased: by which means it absorbs the moisture from all things in the room containing it—rendering *them* indeed more dry, but becoming more moist itself. The effects of this, and of an artificial summer temperature (say 76° Fahr.) upon the human system, especially in a person unaccustomed to it, are an unusual dryness of the air-passages of the mouth and throat, creating a disposition to thirst, and requiring a larger supply of fluid, in the way of drink, than is customary in the cold season of the year; while if, as is commonly the case in this season, even in the house, the dress is materially thicker than in summer, a corresponding increase of the perspiration from the surface of the body is also produced; and this elimination of fluid from the skin, though it renders it more moist, diminishes rapidly the quantity in the system, and co-operates with the increase of evaporation from the lining of the air-passages, in creating the demand for a larger supply of drink. In this however there is no especial harm, as it is only what happens naturally in the warm season of the year; and if the desire be moderately and reasonably gratified with appropriate liquid, the adjustment of the system will take care of itself. This amount of heat, 76°, is, however, rather excessive for persons in health warmly clothed, and who are frequently passing out into the cold external air; as the pores of the skin are too much opened by it, and they run the risk of taking cold by a sudden check of the perspiration in the parts of the surface most exposed to the chill of the atmosphere.

Now the effect of throwing into air already warm and unduly moist, a large additional supply of warm vapour (as is the case when water is suffered to evaporate from the top of a stove), is to produce a relaxing effect upon all the surfaces of the body exposed to its influence, both the mucous membranes and the skin, and thereby to render one more liable to feel the ill effects of a check from coming in contact with the cold external air. If any thing in the way of an extra supply of moisture were advisable or admissible, it would be simply to place a vase or two of water in different parts of the room, and let the air drink from it gradually, and at its own temperature, a sufficient supply of moisture to satisfy its capacity. It would thus be naturally saturated, and no more; and the furniture at least would escape injury, and possibly, perhaps probably, the human form would receive no detriment, if the warmth of the room was limited to about 62°—65°, which will be quite sufficient for comfort for healthy persons, fairly clad for the cool or cold season. In the case of invalids, some departure from these limits, both of warmth and moisture, may be advisable, according to circumstances; but these should be regulated by the advice of the medical attendant, to suit the requisitions of each case.—[*Silliman's American Journal.*]

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

July 28th, 1852.

THE GENERAL MEETING of the Members was held at the house of the Institution, 54, Newhall-street, Birmingham, when the discussion, adjourned from the last meeting, was resumed, upon the paper by Mr. ANDREW J. ROBERTSON, of London, "*On the mathematical principles involved in the centrifugal pump.*"

The general result arrived at by the investigation in this paper* was, that centrifugal action is not an economical mode of applying power for raising water, and that the theoretical limit to the useful effect to be obtained by centrifugal action alone, is 50 per cent. of the power employed,—a loss of 50 per cent. of the power being caused by the absorption of power in the tangential velocity given to the water; whilst the radial or centrifugal velocity alone is effective in raising the water. But the practical limit of the useful effect is reduced to 75 per cent. of the above 50 per cent., or only $37\frac{1}{2}$ per cent. of the power employed, in consequence of the unavoidable losses arising from friction and practical imperfections.

The following supplementary calculations, illustrating the theory advanced in the paper, were supplied by Mr. Stein, respecting the results to be obtained from the experiment with Gwynne's centrifugal pump, which was described by Mr. Edwards at the former meeting. In that experiment (recently made by Mr. Edwards with a centrifugal pump, containing some further improvements of his own invention), it was stated, that 650 gallons of water per minute were raised to a height of $17\frac{1}{2}$ feet by a revolving disc 13 inches diameter, driven at 800 revolutions per minute; and the driving power was a high-pressure steam-engine, with 8-inch cylinder and 18-inch stroke, working 100 double strokes per minute, with an effective pressure on the piston of about 43 lbs. per inch.

The piston being $50\frac{1}{4}$ inches area (8 inches diameter), and moving at the velocity of 300 feet per minute (200 strokes of $1\frac{1}{2}$ feet),

$$\left.\begin{array}{r}\text{The power expended on the}\\ \text{piston of the engine was}\end{array}\right\}\ \frac{\overset{\text{sq. ins.}}{50\frac{1}{4}} \times \overset{\text{lbs.}}{43} \times \overset{\text{ft.}}{300}}{33{,}000} = 19{\cdot}6 \text{ horse-power.}$$

$$\text{The effect obtained was } \frac{\overset{\text{gals.}}{650} \times \overset{\text{lbs.}}{10} \times \overset{\text{ft.}}{17\frac{1}{2}}}{33{,}000} = 3{\cdot}4 \text{ horse-power.}$$

Therefore the useful effect was 18 per cent. of the power expended.

According to the theory of the centrifugal pump in the paper, "the power expended on the pump is measured by the quantity of water delivered, raised to twice the height due to the velocity of the circumference of the arms; whilst the useful effect produced is the water delivered, raised to the height of discharge."

* See page 143, *ante*.

In the above case, the velocity of the circumference of the arms was 2,722 feet per minute, and the height due to that velocity (or the height of fall required to obtain that velocity by the action of gravity) is 32·3 feet, and twice the height is 64·6 feet; whilst the height of discharge was 17·5f eet. Consequently, the theoretical proportion of the useful effect to the power expended on the pump would be 17·5 to 64·6; and the effect obtained in the experiment, as above, being 3·4 horse-power, the power required to produce that amount of mechanical effect under these circumstances (without considering the losses from friction and practical defects) would be $3{\cdot}4 \times \frac{64{\cdot}6}{17{\cdot}5} = 12{\cdot}6$ horse-power, or, in this case, a theoretical efficiency of 27 per cent. The whole power employed having been 19·6 horse-power, this leaves 7 horse-power, or 35 per cent. of the whole, as the loss due to friction and practical defects, both in the engine and the pump.

Mr. Appold, in compliance with the request of the Chairman, furnished drawings of the pump that he had shewn at work in the Exhibition of 1851, and which had been experimented upon by the jury at the Exhibition. The revolving fan is one foot diameter, and three inches wide, having an opening one-half the total diameter in the centre of each side, for the admission of the water, and a central division-plate, extending to the circumference, to give a direction to the two streams of water: the six arms are curved backwards, terminating nearly tangential to the circumference. The revolving fan is fixed on the end of the driving-shaft, which passes through a stuffing-box in the side of the casing; and it works between two circular cheeks, running close without actually touching, which shield the outer revolving surfaces of the fan from the water, but allow a free ingress for the water to enter; and a large space is left all round the circumference of the fan, to facilitate the escape of the discharged water.

Mr. Appold stated, that a series of experiments had been tried with his pump at the Exhibition, to ascertain the per-centage of useful effect that was yielded by it when raising water to different heights. These experiments were conducted by the jury of the Exhibition; and the power employed in each experiment was measured with great accuracy by means of Morin's dynamometer. The driving-strap from the steam-engine was passed over the first pulley of the dynamometer; and the pump was driven from a second pulley, running loose on the same shaft, and connected to the first by means of a spring, through which all the power was consequently transmitted. The amount of the driving power was indicated by the extent to which the spring was compressed, which was shewn by a continuous pencil-mark upon a paper cylinder connected to the instrument, and from which the actual tension of the driving strap at all periods of the experiment was accurately ascertained. The following results were obtained by this means, and were published in the report of the jury:—

Experiments on Appold's centrifugal pump with curved arms.

Per-Centage of Effect to Power.	Height of Lift.	Discharge per Minute.	Revolutions of Pump per Minute.	Velocity of Circumference.
	Feet.	Gallons.		Feet per Minute.
59	8·2	2100	828	2601
65	9·0	1664	620	1948
65	18·8	1164	792	2488
68	19·4	1236	788	2476
46	27·6	681	876	2751
With straight inclined arms.				
43	18·0	736	690	2168
With straight radial arms.				
24	18·0	474	720	2262

In the experiments with straight arms, the revolving fan was removed, and others were fixed in its place, exactly similar in other respects, but having straight arms, inclined at 45°, or radial, instead of the curved arms.

Mr. Appold said he had made a series of experiments previously, with a similar centrifugal pump, one foot diameter, with curved arms, and had constructed a dynamometer to measure the amount of driving power, by driving the pump from a loose 4-feet drum, and connecting that drum to the driving shaft by a Salter's spring balance, attached to an arm which was fixed on the shaft and thus pulled round the drum. The extent to which the spring was stretched shewed the amount of force employed in the driving power; and this was marked by a slide upon the balance, which was pulled out with the spring, and remained in the extreme position it had been pulled to, so that the extreme pressure could be read off when the machine was stopped. The following results were thus obtained:—

Experiments on Appold's pump with curved arms.

Height of lift of the water 5½ feet in each case.

Per-Centage of Effect to Power.	Discharge per Minute.	Revolutions of Pump per Minute.	Velocity of Circumference.	Driving Power at Circumference of Pump.
	Gallons.		Feet per Minute.	lbs.
0	1	359	1128	8
21	100	375	1177	11
55	400	394	1238	16
66	700	427	1341	21¾
70	1000	474	1487	26½
72	1300	518	1627	30¼
70	1600	580	1822	34½
69	1800	607	1907	37½

Mr. Clift remarked, that it appeared, from the experiments, there was a certain velocity that gave the maximum duty in centrifugal pumps, and they were more limited in application, on that account, than piston-pumps.

Mr. Appold replied, that the same circumstance applied to a common pump, though not to the same extent; if, for instance, an ordinary pump, capable of delivering 1400 gallons per minute, with the best duty, were set to work so as to deliver only 400 gallons per minute, the duty or per-centage of useful effect would be certainly much reduced; as every pump must be proportioned to the work to be done, or it will not give a maximum effect. In the centrifugal pump, the velocity of the circumference must be constant for all sizes of pump for the same height of lift: that is, a pump 1 inch diameter must make 12 times the number of revolutions per minute of one 12 inches diameter, and both pumps will then raise the water to the same height; but the quantity of water delivered will be 144 times greater in the 12-inch pump,—being in proportion to the area of the discharging orifices at the circumference, or the square of the diameter, when the proportion of breadth was kept the same; namely, one-fourth of the diameter in each case.

Mr. Appold shewed a small pump, of the same proportions, but only one inch diameter, with which similar experiments had been tried as with the one-foot pump, and proportionate results were obtained.

This pump,	1 inch	diam.,	discharged	10 gal. per min.
And one	1 foot	"	"	1440 " " "
Consequently,	10 feet	"	"	144000 " " "

The height that the water was lifted being the same in each case, if the velocity of the circumference was the same. A velocity of 500 feet per minute of the circumference raised the water one foot high, and maintained it at that level without discharging any; and a double velocity raised the water to four times the height, as the centrifugal force was proportionate to the square of the velocity: consequently,

500 feet	per min.	raised	the water	1	foot	without	discharge.
1000	"	"	"	4	"	"	"
2000	"	"	"	16	"	"	"
4000	"	"	"	64	"	"	"

The greatest height to which the water had been raised, without discharge, in the experiments with the one-foot pump, was 67·7 feet, with a velocity of 4153 feet per minute,—being rather less than the calculated height, owing probably to leakage with the greater pressure.

A velocity of 1128 feet per minute raised the water 5½ feet without any discharge; and the maximum effect from the power employed in raising to the same height, 5½ feet, was obtained at the velocity of 1678 feet per minute, giving a discharge of 1400 gallons per minute from the one-foot pump. The additional velocity required to effect the discharge is 550 feet per minute;

or the velocity required to effect the discharge of 1400 gallons per minute through a one-foot pump, working at a dead level, without any height of lift, is 550 feet per minute: consequently, adding this number, in each case, to the velocity given above, at which no discharge takes place, the following velocities are obtained for the maximum effect to be produced in each case:

1050 feet per minute velocity, for			1 foot height of lift.		
1550	"	"	4	"	"
2550	"	"	16	"	"
4550	"	"	64	"	"

Or, in general terms, the velocity in feet per minute for the circumference of the pump to be driven, to raise the water to a certain height, is equal to—

$$550 + (500 \sqrt{\text{height of lift in feet.}})$$

Mr. Appold, in reply to a remark of Mr. B. Gibbons, observed, that he did not know a piston-pump that yielded so good a duty as 70 per cent., which might be taken as the effect obtained from his centrifugal pump, when working at the most effective velocity. The greatest result obtained in the experiments at the Exhibition was 68 per cent.; but some allowance had to be added, in that case, for the leakage through several large wood valves, four feet long, faced with leather, which were fixed in the suction-pipe of the pump, to pump the water from different levels.

There were some situations where it was the most important consideration for a pump to be quickly and readily applied, that would discharge a very large quantity of water; and the centrifugal pump was found very advantageous in such cases, where the work could not probably be effected by other means. In one instance, in putting in the foundations of harbour works at Dover, a large quantity of water, from 2000 to 3000 gallons per minute, was pumped out by one of these pumps, which could not have been accomplished in the time by any other means, from the difficulty and delay of fixing ordinary pumps of that great capacity. The centrifugal pump had another important advantage for such applications, from having no valves in action when at work, which enabled it to pass large stones, and almost anything that was not too large to enter between the arms.

The largest pump constructed at present on this plan was erected at Whittlesea Mere, for the purpose of draining, and has worked there nearly a year with complete success. The pump is 4½ feet diameter, with an average velocity of 90 revolutions, or 1250 feet per minute, and is driven by a double-cylinder steam-engine, with steam 40 lbs. per inch, and vacuum 13½ lbs. per inch: it raises about 15,000 gallons of water per minute an average height of four or five feet. The cost of the engine and pump was about £1600. The following experiments were tried to ascertain the per-centage of effect obtained from the pump,—the power employed being measured by taking indicator-figures from the engine, deducting, in each case, the power that was indicated

when the engine was working at the same speed without the pump, which was found to take 10·6 horse power. The quantity of water discharged was measured by calculating the overflow from an opening six feet wide in each case.

Experiments on Appold's Pump at Whittlesea Mere.

No. of Experiment	1	2	3	4
Velocity of circumference of pump, in feet, per minute	1159	1357	1301	1329
Height of lift of the water, in feet and inches	3··0	4··1	5··0	5··11
Depth of water at point of overflow ...... A	1··4	1··5½	1··3⅜	1··2
Ditto at 17 feet distance .... B	1··7	1··8¼	1··6⅜	1··5
Gallons discharged per minute, according to the depth .... A	12429	14223	11706	9545
Ditto ditto .... B	16104	18023	15288	13606
Theoretical discharge	17400	21587	15768	12803
Horse-power effective in raising the quantity .... A	11·34	16·88	17·79	17·17
Ditto ditto .... B	14·70	22·38	23·24	24·49
Horse-power employed in working the pump	23·00	40·90	29·90	39·80
Per-centage of effect to power employed, by calculation .... A	49	41	60	43
Ditto ditto .... B	64	55	78	61

The true result would be between these two calculations, A and B; and the maximum effect might probably be taken at about 68 per cent. of the power,—the same result as that obtained from the Exhibition experiments.

Mr. B. Gibbons was of opinion that, for ordinary lifts, of say 10 to 30 feet, a bucket-pump, of good construction, performs more than 70 per cent. duty, and would be found, consequently, more economical in power than a centrifugal pump.

Mr. Appold said, he found the centrifugal pump more advantageous for low lifts below 20 feet, than for higher lifts; but its most advantageous application was as a tidal pump, where the height of lift was continually varying; because it discharged more water the lower the lift—the pump still going at the same speed; but other pumps generally discharge only their cubic contents, no matter how low the lift. In one centrifugal pump, erecting at Shoreham, the height of lift will vary between 30 feet and nothing, at different times of the tide. One of these pumps had been applied by Messrs. Curtis, at the Hounslow Powder Mills, to keep the water-wheel going constantly in the summer time, when short of water. The water was pumped up 7 feet high, by running the steam-engine a few hours extra at night, at a small expense, which completely kept up the supply for the water-wheel, and avoided bringing the engine any nearer the Powder Mills. The centrifugal pump was very convenient and economical for this purpose, and the result was found so satisfactory that a second pump was going to be erected for a similar purpose.

The Chairman inquired whether Mr. Appold considered the

spiral form of the arms an essential point in his pump, instead of the radial arms in the other centrifugal pumps?

Mr. Appold replied, that the oblique position of the arms was most important, and the large amount of duty obtained from his pump was entirely owing to it. He had at first tried straight arms, inclined at 45°; but he found that the curved arms, ending nearly in a line with a tangent to the outer circumference, gave the greatest effect. The comparative value of the different forms of arms was proved by the experiments at the Exhibition before mentioned: the curved arms gave a duty of 68 per cent., the inclined arms 43 per cent., and the radial arms only 24 per cent.; and he understood that the two other centrifugal pumps of Mr. Gwynne and Mr. Bessemer, which were also experimented upon at the Exhibition, did not give a higher duty than 24 per cent., as they both had straight radial arms. The facts quite bore out, therefore, the conclusions arrived at by the investigation in the paper that had been read, as to the effects to be obtained from centrifugal action with radial arms.

The following paper, by Mr. John E. Clift, of Birmingham, was then read, "*On improved fire-brick gas retorts.*"

The object of this paper is to describe a plan for constructing gas retorts, which the writer has had in use several years at the works under his management, and has also adopted at various other towns.

The first great desideratum in a gas-generating retort is on all hands acknowledged to be a large surface, upon which may be spread a thin layer of coal: this was early shewn by Mr. Clegg, in his invention of the revolving-web retort,—the only difficulty in working which was the destructible nature of the material of which it was composed.

The second condition required is, that this large surface shall be economically heated. A stong opinion existed, for a long time, against the use of fire-clay for retorts, in consequence of the inferior heat-conducting properties of that material compared with iron; but experience has proved that as large a quantity of gas can be generated, with a given weight of fuel, with fire-clay retorts as with iron. This may be accounted for partly by the fire-clay losing less of its heat on being exposed to the air whilst charging, and on the cold charge of coal being first thrown in; or, in other words, that the greater mass of fire-clay acts as a reservoir of heat, and does not become so readily exhausted when a large demand is made upon it, but, on the contrary, maintains a greater uniformity of temperature throughout the process: this is easily demonstrated by observing the small quantity of gas made from an iron retort, during the first hour after charging, compared with a fire-clay one. It is also partly accounted for by the iron retorts, as they are generally set, being so covered and shielded with fire-bricks, to preserve them from destruction, as to partake as much of the character of clay retorts as of iron.

The following table, which is the average of a number of ex-

periments, gives the quantities of gas generated, as indicated by the meter, from iron and clay retorts, during each half hour of the charge, from the same quantity and quality of coal:—

IRON RETORTS.		BRICK RETORTS.	
1 half-hour.	250 cubic feet.	1 half-hour.	480 cubic feet.
2 „	630 „	2 „	1800 „
3 „	1340 „	3 „	2000 „
4 „	2300 „	4 „	2000 „
5 „	2600 „	5 „	2300 „
6 „	2640 „	6 „	2300 „
7 „	2600 „	7 „	2460 „
8 „	2600 „	8 „	2400 „
9 „	1700 „	9 „	2000 „
10 „	1630 „	10 „	1630 „
11 „	1790 „	11 „	860 „
12 „	700 „	12 „	550 „
Total	20780	Total	20780

The third requisite in a retort is durability. The proper way to measure this element is to divide the quantity of gas made, by the cost of the retorts and ovens, and the repairs during the time they are worked: this will be shewn presently by a comparison from the actual working of iron and clay retorts.

The retorts to be described in the present paper are composed entirely of fire-bricks, with cast-iron front plates to attach the mouth-pieces to, and to bind the brickwork together; and they are made of any length, width, or height. They are generally constructed in sets of three, with one large retort above and two smaller ones beneath, as shewn in the drawings which accompanied the paper. The cast-iron front plates are $1\frac{1}{8}$ inch thick. The wrought-iron stays for the same are $4 \times 1\frac{1}{2}$ inches, and are fastened at the bottom by cramps built into the brickwork, and at the top by tension-bars, connected to similar stays on the opposite side.

The two lower retorts are 15 inches wide, 15 inches high, and 20 feet long, with a mouth-piece at each end. The fire-bricks, forming the bottoms and sides of the retorts, are 16 inches long and 3 inches thick; and the arch-bricks, forming the top, are 9 inches long by $3\frac{1}{2}$ inches deep. Each brick is rebated 1 inch deep in the transverse joints, and grooved in the longitudinal joints; and these grooves are filled with stiff fire-clay when they are put together, which burns into a hard tongue, half an inch thick, as it becomes heated: the object of these tongues is two-fold,—they offer a resistance to the leakage of the gas by breaking the joint, and they tie together the arch of the retort.

The large upper retort is 5 feet 3 inches wide, and 20 fect long, and open for charging at both ends. The bricks are similar to those forming the small lower retorts. There is a cross-arch, 5 inches thick, spanning the furnace flat on the top, which covers the under side of the transverse joints of the bottom of the large retort; and the longitudinal joints are covered by small

arched bricks. Two furnaces are employed, one at each end of the oven, separated by a transverse wall. In rising from each furnace, the heat passes partly underneath and partly over the small retorts into the first flue, at either side of the large retort; and thence it proceeds through a series of flues above that retort into a main flue leading to the chimney. By this arrangement, the heat is caused to pass over 50 feet length of surface of retort from the time it leaves the furnace until it reaches the main flue.

With regard to durability, the writer states that 12 sets of these retorts were put up by him in 1842, and worked constantly, with the exception of short periods, up to 1849, when they were taken down for the alteration of the works, and they were found then in good condition, and were fit for working several years longer with slight repairs. The writer also put up 12 sets of these retorts in 1844, and they continue in regular work now, and are in good condition: the cost of repairs of the retorts, ovens, and furnaces, during the eight years they have worked, has not exceeded 20*s*. per annum for each set.

The writer accounts for the durability and economy of retorts constructed on this plan, firstly, by their being composed of a great number of pieces, instead of only one; so that when their temperature is altered, either by the carelessness of the stokers, or in letting down the heat to throw the retort out of work, each joint opens a little, equal to the contraction of a 9-inch brick, and prevents any portion of the retort cracking. In the same way, in getting up the heat (which is a time when a great number of clay retorts made in one piece are destroyed), if one portion of the retort becomes heated more than another, the joints accommodate the expansion; or, if the brickwork is in a very green state, and the expansion from the moisture is great, the screws of the tension-rods may be eased, which will allow the whole mass of brickwork to swell; but, as soon as the moisture is expelled, it will sink back into its place, and be as perfect as when first built. When a set of these retorts is first put to work, either new, or after being let down for any purpose, it leaks through the joints for about 24 hours, gradually stopping; and, after that time, if the heat be good, it will have become quite sound, and permanently gas-tight, under a pressure equal to 10 or 12 inches head of water.

From a sufficiently long experience, the writer has proved that brick retorts, built upon this plan, will wear for 10 years, with the outlay of 20*s*. per annum for repairs, and that iron retorts will not last more than 1½ years, under the most favorable circumstances. Then, to shew their comparative economy, take a number, say 20 sets or beds of iron retorts, and 20 beds of brick retorts,—each bed being capable of making 20,000 cubic feet of gas in 24 hours; and, to make the calculations as correct as possible, let the cost and repairs of each be estimated, and the quantity of gas they will make, during a period of 10 years, in

order to ascertain the cost of the gas produced from each plan per 10,000 cubic feet.

First cost of 20 beds of iron retorts:—

Bricks, clay, and labor, for arches			£367 0 0
100 cast-iron retorts, 18 cwt. each, 90 tons, at £6			540 0 0
Fire-bricks, shields, quarries, &c., for setting			150 0 0
Labor for setting, 60*s*. each set ..			60 0 0

Cost of renewing 20 beds of iron retorts:—

100 iron retorts, 90 tons, at £6 ..		£540 0 0	
Bricks and clay		150 0 0	
Labor, taking down and resetting..		80 0 0	
		£770 0 0	
Less by old burnt iron, 50 tons, at £25*s*...	£62 10 0		
Less by one-third of bricks, which may be used again	50 0 0	112 10 0	
		£657 10 0	
This sum will be multiplied by 6½ the number of times they will be renewed in 10 years, which will give			4,270 10 0
Making the total expense of iron retorts			£5,387 10 0

First cost of 20 beds of brick retorts:—

Bricks, clay, and labor, for arches..			£367 0 0
Iron for front plates and brick-stays, 21 tons, at £6			126 0 0
Pattern and other bricks and clay for retorts			180 0 0
Labor for building retorts........			110 0 0
			£783 0 0
Cost of repairs for 10 years, at 20*s*. per bed per annum	£100 0 0		
Less value of old front plates, &c., 20 tons, at 25*s*..............	25 0 0		
			75 0 0
Making the total expense of brick retorts			£858 0 0

Now, as the quantity of gas that each of the two descriptions of retorts is estimated to generate is the same for 10 years, namely, 1,460 millions cubic feet, it follows that the gas from the cast-iron retorts costs 9*d.* per 10,000 cubic feet, and that from the fire-brick retorts $1\frac{1}{3}$*d.* per 10,000 cubic feet, for the item of retorts and ovens;—shewing an economy of 84 per cent. in the improved fire-brick retorts.

Mr. Chellingworth enquired whether a defect in a brick retort could be repaired, such as a bad joint? When an iron retort became broken, it could not be repaired, and was all lost, and had to be pulled out; but it was a great advantage in the brick retorts if they could be readily repaired.

Mr. Clift replied, that a defect could be easily repaired at any time, without stopping the working of the retorts. The surface of the retorts could be thoroughly examined through the different sight-holes of the oven, and any defective joint detected by the appearance of a gas-flame; and a single brick could be taken out of any part when required, and removed by proper tools through the sight-holes, which were made large enough for a brick to pass; and another brick was then set in its place with fire-clay, without occasion to let down the heat of the retort. When a brick retort was pulled down, it was found that the carbon deposited from the gas filled up any crack or fracture, by the carbon adhering to the rough surface of the brick and collecting upon it, from the indestructible nature of the brick. But a crack in a cast-iron retort continued getting worse, and became constantly more open, on account of the surface of the iron perishing in the sides of the crack, which prevented it from getting closed up by a deposit of carbon, as in the brick retorts. When a cast-iron retort was once cracked it was done for, and must be thrown away, requiring the whole oven to be opened out and rebuilt, and causing a serious delay to the work, as well as expense.

Mr. Ramsbottom remarked, that the greater equality in the rate of expansion by heat of carbon and fire-brick, than of carbon and cast-iron, would probably assist in keeping the joints close.

Mr. Clift observed, that on pulling down the brick retorts, after seven years' working, it was found that the joints were completely blackened, and filled with carbon half way through, up to the fire-clay stopping in the centre groove; but the outer half of the joints shewed no appearance of the carbon having passed the groove. The plan of constructing the retorts of double the usual length, with a mouth-piece at each end, he had only had in use for about a year; but he found it a decided improvement, and had since adopted it in all new works. The other retorts became scurfed up with a large accumulation of carbon, particularly at the back ends, where the scurf became several inches thick, and very hard; and the retorts had to be stopped work, and the heat let down, usually every eight months, for the purpose of clearing

out this scurf, and getting it detached by the contraction in cooling. But in the long retorts, open at both ends, there was no back for the scurf to accumulate; and the current of air through the retort, every time that both ends were opened, caused the scurf to scale off, and it was much easier to detach; and, consequently, it was found that they would work much longer before requiring to be let down. Also, the centre portion of the oven, which is the hottest part, and most valuable for making gas, was lost before by the blank ends of the retorts, but is now made available, as there is only a single brick wall dividing the flues; and, by this means, the heating surface and contents of the retorts are increased, without any increase in the size or expense. Another advantage is found in preventing the injury and shaking of the joints that was caused in drawing the coke from the retort, by the heavy rake being driven against the back of the retort.

List of Patents

That have passed the Great Seal of IRELAND, from the 17*th August to the* 17*th September,* 1852, *inclusive.*

To Joshua Crockford, of Southampton-place, in the county of Middlesex, Gent., for improvements in brewing and in brewing apparatus.—Sealed 11th September.

Henry Bessemer, of Baxter House, Old Saint Pancras-road, in the county of Middlesex, for improvements in expressing saccharine fluids, and in the manufacture, refining, and treating sugar.—Sealed 11th September.

List of Patents

Granted for SCOTLAND, from the 22nd August, to the 22nd September, 1852.

To Joseph William Schlesinger, of Brixton, for improvements in fire-arms, in cartridges, and in the manufacture of powder,—being a communication.—Sealed 26th August.

Frederick Sang, of No. 58, Pall Mall, London, Artist in Fresco, for certain improvements in floating and moving vessels, vehicles, and other bodies, in and over water.—Sealed 26th August.

Joseph Denton, of Prestwick, Lancashire, for certain improvements in machinery or apparatus for manufacturing looped, terry, or other similar fabrics.—Sealed 26th August.

Alexander Parkes, of Birmingham, for improvements in separating silver from other metals (going over again).—Sealed 26th August.

James Warren, of Montague-terrace, Mile-End-road, for improvements applicable to railways and railway carriages; and improvements in paving (going over again).—Sealed 26th August.

Thomas Richardson, of Newcastle-on-Tyne, for improvements in the manufacture and preparation of magnesia and some of its salts (going over again).—Sealed 26th August.

Alexander Stewart, of Glasgow, for improvements in the manufacture or production of ornamental fabrics.—Sealed 27th August.

Sir John Scott Lillie, of Pall Mall, London, for certain improvements in the construction or covering of walls, floors, roads, foot-paths, and other surfaces (going over again).—Sealed 31st August.

Pierre Isidore David, of Paris, machinist, for certain improvements in the method of bleaching, and in the apparatus connected therewith.—Sealed 1st September.

Joshua Crockford, of Southampton-place, London, for improvements in brewing and in brewing apparatus.—Sealed 2nd September.

Thomas Wilks Lord, of Leeds, flax and tow machine-maker, for improvements in machinery for spinning, preparing, and heckling of flax, tow, hemp, cotton, and other fibrous substances; and for the lubrication of the same and other machinery,—being a communication.—Sealed 2nd September.

Edward Morewood and George Rogers, of Enfield, for improvements in the manufacture, shaping, and coating of metals; in applying sheet metal to building purposes; and in the means of applying heat.—Sealed 6th September.

George Wright, of Sheffield, and also of Rotherham, in the county of York, for improvements in stoves, grates, or fire-places.—Sealed 11th September.

Thomas Hunt, of Leman-street, Goodman's Fields, in the county of Middlesex, for improvements in fire-arms.—Sealed 13th September.

Alexander Mills Dix, of Salford, in the county of Lancaster, brewer, for certain improvements in artificial illumination, and in the apparatus connected therewith; which improvements are also applicable to heating and other similar purposes.—Sealed 16th September.

John McConochie, of Liverpool, in the county of Lancaster, engineer, for improvements in locomotive and other steam-engines and boilers; in railways; railway carriages and their appurtenances;—also in machinery and apparatus for producing part or parts of such improvements.—Sealed 20th September.

New Patents

SEALED IN ENGLAND.

1852.

To William Henry James, of Great Charlotte-street, in the county of Surrey, civil engineer, for improvements in heating and refrigerating, and in apparatus connected therewith. Sealed 3rd September—6 months for inrolment.

Peter Armand Le Comte de Fontainemoreau, of South-street, Finsbury, in the county of Middlesex, for improvements in producing gas, and in its application to heat and light,—being a communication. Sealed 7th September—6 months for inrolment.

John James, of Leadenhall-street, in the City of London, manufacturer, for certain improvements in weighing-machines and weighing-cranes. Sealed 9th September—6 months for inrolment.

Henri François Toussaint, of Paris, in the Republic of France, Gent., for improvements in obtaining a product from the wood of the cactus. Sealed 10th September—6 months for inrolment.

Julian Bernard, of Guildford-street, Russell-square, in the county of Middlesex, Gent., for improvements in the manufacture or production of boots and shoes; and in materials, machinery, and apparatus connected therewith. Sealed 10th September—6 months for inrolment.

John Wright Treeby, of Elizabethan Villa, Saint John's Wood, in the county of Middlesex, Gent., for improvements in regulating the flow of liquids. Sealed 10th September—6 months for inrolment.

Stephen Taylor, of New York, Gent., for certain improvements in the construction of fire-arms, and in cartridges for charging the same,—being a communication. Sealed 10th September—6 months for inrolment.

Alexander Stewart, of Glasgow, manufacturer, for improvements in the manufacture or production of ornamental fabrics. Sealed 10th September—6 months for inrolment.

Frederick Sang, of Pall Mall, in the county of Middlesex, Artist in Fresco, for certain improvements in floating and moving vessels, vehicles, and other bodies, on and over water. Sealed 16th September—6 months for inrolment.

Charles Augustus Preller, of Abchurch-lane, in the City of London, merchant; John Eastwood, of Bradford, in the county of York, wool-comber; and Samuel Gamble, of Bradford aforesaid, machine-maker, for improvements in machinery for combing, drawing, or preparing wool, cotton, silk, hair, and other fibrous materials. Sealed 16th September—6 months for inrolment.

John Macintosh, of New-street, in the county of Surrey, civil engineer, for improvements in manufacturing and refining sugar. Sealed 18th September—6 months for inrolment.

James Pillans Wilson, of Belmont, Vauxhall, in the county of Surrey, Gent., for improvements in the manufacture of cloths, and in the preparation of wool for the manufacture of woollen and other fabrics, and in the preparation of materials to be used for these purposes. Sealed 18th September—6 months for inrolment.

John Michell, of Calenick, Cornwall, for improvements in purifying tin ores, and separating ores of tin from other minerals. Sealed 18th September—6 months for inrolment.

William Smith, of Little Woolstone, in the county of Bucks, farmer, for improvements in machinery for reaping. Sealed 18th September—6 months for inrolment.

George Hutchison, of Glasgow, in the Shire of Lanark, merchant, for a method of preparing oils for lubricating and burning. Sealed 18th September—6 months for inrolment.

James Warren, of Montague-terrace, Mile-End-road, and Bernard Peard Walker, of North-street, Wolverhampton, for improvements in the manufacture of screws and screw-keys, and in the construction of bridges, applicable to floorings, roofings, and paving. Sealed 18th September—6 months for inrolment.

Moses Poole, of the Patent Office, London, Gent., for improvements in combining caoutchouc with other matters,—being a communication. Sealed 18th September—6 months for inrolment.

François Mathieu, of Hatton-garden, in the county of Middlesex, Gent., for improvements in apparatus for containing, aerating, refrigerating, filtering, and drawing off liquids, and in ornamenting such apparatus,—being a communication. Sealed 23rd September—6 months for inrolment.

John Lawson and Edward Lawson, both of Leeds, machine-makers, for improvements in machinery for scutching and cleaning flax-straw. Sealed 23rd September—6 months for inrolment.

Jacques Leon Tardieu, of Paris, Gent., for certain improvements in the coloring of photographical images. Sealed 23rd September—6 months for inrolment.

Robert Bowman Tennent, of Gracechurch-street, in the City of London, merchant, for certain improvements in the mode of pulping cherry coffee, and in the machinery applicable thereto. Sealed 24th September—6 months for inrolment.

Henry Medhurst, of Clerkenwell, in the county of Middlesex, engineer, for improvements in water-meters, and in regulating, indicating, and ascertaining the supply of water and liquids. Sealed 27th September—6 months for inrolment.

CELESTIAL PHENOMENA FOR OCTOBER, 1852.

D.	H.	M.	
1			Clock after the ☉ 10m. 27s.
	—		☽ rises 7h. 12m. A.
	—		☽ pass mer. 1h. 51m. M.
	—		☽ sets 9h. 2m. M.
	1	32	☿ in conj. with Ceres, diff. of dec. 6. 22. S.
	6	5	♄ in conj. with the ☽ diff. of dec. 1. 5. N.
	8	20	☿ greatest hel. lat. N.
2			Occul. B.A.C. 1272, im. 10h.27m. em. 10h. 52m.
5			Clock after the ☉ 11m. 40s.
	—		☽ rises 9h. 18m. A.
	—		☽ pass mer. 4h. 45m. M.
	—		☽ sets 1h. 22m. A.
6	10	36	☽ in □ or last quarter
9	8	46	♀ in conj. with the ☽ diff. of dec. 5. 1. S.
10			Clock after the ☉ 13m. 3s.
	—		☽ rises 1h. 53m. M.
	—		☽ pass mer. 9h. 24m. M.
	—		☽ sets 4h. 37m. A.
11	5	42	♃'s first sat. will em.
12	10	12	☿ in conj. with the ☽ diff. of dec. 3. 54. S.
13	7	14	Ecliptic conj. or ● new moon
	8		☽ in Perigee
14	14	45	♂ in conj. with the ☽ diff. of dec. 4. 0. S.
	15	12	♀ in the ascending node
15			Ceres greatest hel. lat. N.
	—		Mercury, R. A., 13h. 16m. dec. 6. 56. S.
	—		Venus, R. A., 10h. 34m. dec. 9. 4. N.
	—		Mars, R. A., 15h. 6m. dec. 17. 52. S.
	—		Vesta, R. A., 3h. 7m. dec. 6. 44. N.
	—		Juno, R. A., 23h. 59m. dec. 7. 55. S.
	—		Pallas, R. A., 11h. 36m. dec. 2. 20. S.
	—		Ceres, R. A., 12h. 11m. dec. 7. 23. N.

D.	H.	M.	
15			Jupiter, R. A., 15h. 31m. dec. 18. 20. S.
	—		Saturn, R. A., 2h. 58m. dec. 14. 12. N.
	—		Uranus, R. A., 2h. 19m. dec. 13. 25. N.
	—		Mercury pass mer. 23h. 42m.
	—		Venus pass mer. 20h. 57m.
	—		Mars pass mer. 1h. 29m.
	—		Jupiter pass mer. 1h. 54m.
	—		Saturn pass mer. 13h. 19m.
	—		Uranus pass mer. 12h. 40m.
	—		Clock after the ☉ 14m. 14s.
	—		☽ rises 9h. 7m. M.
	—		☽ pass mer. 1h. 56m. A.
	—		☽ sets 6h. 34m. A.
	1	20	♃ in conj. with the ☽ diff. of dec. 2. 24. S.
17	20	38	☿ in sup. conj. with the ☉
19	11	56	☽ in □ or first quarter
20			Clock after the ☉ 15m. 10s.
	—		☽ rises 2h. 38m. A.
	—		☽ pass mer. 6h. 43m. A.
	—		☽ sets 10h. 53m. A.
21			Occul. *k* in Capricorni, im. 6h. 29m., em. 7h. 34m.
24			Occul. 30, Piscium, im. 5h. 17m. em. 5h 53m.
	—		Occul. 33, Piscium, im. 7h. 13m. em. 8h. 25m.
	5	33	♃'s third sat. will em.
	20		☿ in the descending node.
25			Clock after the ☉ 15m. 51s.
	—		☽ rises 4h. 29m. A.
	—		☽ pass mer. 10h. 28m. A.
	—		☽ sets 3h. 32m. M.
27	2	56	♂ in conj. with ♃ diff of dec. 1 12 S.
	11	54	Ecliptic oppo. or ○ full moon
	12	0	☽ in Apogee
	13	1	♅ in conj. with the ☽ diff. of dec. 3. 53. N.
28	8	24	♄ in conj. with the ☽ diff. of dec. 1. 4. N.
29	5	46	♅ oppo. to the ☉
30	3	26	Vesta in conj. with ♄ diff. of dec. 8. 8. S.

J. LEWTHWAITE, Rotherhithe.

THE

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AND

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CONJOINED SERIES.

No. CCLI.

RECENT PATENTS.

To William Squire, *now of High Holborn, but late of George-street, Euston-square, both in the county of Middlesex, piano-forte maker, for improvements in the construction of piano-fortes.*—[Sealed 31st January, 1852.]

This invention has reference, firstly, to an improved repeating check-action, applicable, with slight modifications, to piano-fortes of both the horizontal and upright or vertical construction; and, secondly, to improved constructions of metallic bracings for piano-fortes.

In carrying out the object to which the first part of the invention relates, the patentee avails himself of the principle of gravitation in lieu of employing springs, as heretofore, for effecting the return of the moving parts of the repeating check-action to their quiescent position; and he is thereby enabled to simplify the construction of the action, and render it applicable as well to horizontal as to upright instruments.

In Plate IX., figs. 1, and 2, are sectional views of the improved action for a cottage piano-forte, exhibiting it in various positions. *a*, is one of the finger-keys of the clavier, mounted in the usual manner, and capable of communicating the motion which it receives from the finger of the player to the jack, and through it to the hammer, by which the strings, commanded by the hammer, are put into vibration, On the inner end of this key rests a lever *b*, which is hinged to the lever-rail; and to this lever *b*, the jack *c*, is jointed. The jack is weighted, so as to give it a tendency to fall forwards towards the strings *d*, of the piano-forte, and bear against the butt of the hammer. *e*, is a set-off lever, jointed to the

hammer-rail *f*. The movement of this lever *e*, is limited by two stop-pieces, affixed to the jack; and in the space between these two stops the head of the lever is intended to remain. Near its upper end the jack is provided with a check-piece *g*, against the padded side of which a check-button *h*, projecting from the butt of the hammer *i*, is made to bear, for the purpose of causing the end of the jack to engage in the notch in the tail of the hammer-butt, immediately it has escaped therefrom, after driving the hammer into contact with the strings. The hammer is jointed to the hammer-rail *f*; and on the inner side of the hammer-butt the lower end of a weighted damper *k*, bears. This damper is jointed to the damper-rail *l*, and is free to move with the hammer. The form of the abutting surfaces of the hammer and damper is such, that as the hammer is driven up to strike the strings, the loss in its sensible or appreciable weight, due to its change of position, will be compensated for by the increasing sensible weight of the damper, and thus a uniform pressure will be upon the key. This compensation is effected by the surfaces rolling against each other, as will be readily understood upon an inspection of figs. 1, and 2.

In fig. 1, the parts of the action are shewn in their quiescent position; but when the key *a*, is depressed by the player, its inner end will rise and lift the lever *b*, into the position indicated by the dotted lines in fig. 1, or by the full-drawn lines in fig. 2. The rising of this lever will throw up the jack *c*, and the lower stop-piece of the jack will lift the set-off lever *e*, causing it to drive back the jack, as shewn. The effect of this sudden movement of the jack will be to throw up the hammer *i*, and cause it to strike the strings *d*. In rising to its striking position, the hammer-butt will force forward the lower end of the damper, and draw the damper-head out of contact with the strings; but, as soon as the pressure of the player's finger is removed from the key, the weighted damper will press back the hammer. The check-button *h*, of the hammer will now come in contact with the check-piece *g*, and thereby transfer the pressure of the damper to the upper end of the jack; by which means the jack will be driven forward to re-engage itself in the notch of the hammer-butt; and, in making this movement, its upper stop will cause the depression of the set-off lever *e*, and thereby allow of the jack returning to the proper position for repeating its action upon the hammer at the next depression of the key. It will be understood, that the value of a repeating check-action depends upon the speed with which the jack, or

other contrivance for lifting the hammer, can be returned to its lifting position; and, on referring to fig. 2, (which shews, by dotted lines, the position of the hammer, when the re-engagement of the jack is effected) it will be seen that this action will take place, in the present instance, as soon as the hammer has passed through about one-third of its return movement; and, consequently, the key will not be required to rise more than about one-third of the distance it has been depressed by the player, to enable the jack to reinstate itself in the notch of the hammer, and effect a repetition of the note last sounded.

From the foregoing description it will be also understood, that the weight of the action is upon the inner end of the key; when, therefore, a light touch is required, it will only be necessary to furnish the key with a counterpoise at its outer end, or at the opposite end to that at which the key is usually weighted, and the desired object will be attained.

At fig. 3, the improved repeating check-action is shewn as applied to a horizontal piano-forte,—the different parts being represented in the positions they would take immediately after striking a note. Instead of the lever *b*, being hinged to the lever-bar, it is, in this arrangement, mounted on a fulcrum-pin *m*, on which it rocks. This pin *m*, is carried by the damper-rail *l*, which is borne up to its required position by a spring *n*, and is capable of being depressed, as usual, by means of a pedal. The lever *b*, carries, at one end, the jack *c*, and at its other end the damper *k*. The connection of the lever with the jack is effected by means of a centre-pin; and a leather hinge is used for connecting the damper and the lever together. In this instance, also, a confined space is provided in the side of the jack, in which the set-off lever *e*, plays in the manner and for the purpose before described; and this lever is rendered adjustable by being hinged to a piece *e**, which can be slidden in a guide (as shewn in the detached cross section fig. 4), attached to the under side of the hammer-rail *f*. Into a nut, affixed to and projecting from the face of this sliding-piece, an adjusting screw *o*, takes; and this screw also passes through a fixed piece *f**, attached to the hammer-rail. By turning this screw *o*, the set-off lever may be adjusted to the required position. Instead of the hammer being jointed, as in the former arrangement, to the hammer-rail, it rocks on a pin held by metal clips *p*, which are bolted to that rail. The action of the parts will be readily traced, as the same letters of reference are used to denote the like parts in this and the first-described arrange-

ment. It will be understood, that the rising of the hammer and the depression of the damper will be simultaneous; and that the weight of the hammer, instead of the weight of the damper, will be employed to effect the re-engagement of the jack with the notch in the hammer-butt, for producing the repeat.

A minor advantage, attendant on the use of this improved action, when applied to horizontal piano-fortes, is, that, as no connection, further than that of contact, exists between the key and the action, any key may be readily removed from the instrument (when such is required) without interfering with any other parts of the instrument.

The second head of the invention, which refers to improvements in metallic bracings for piano-fortes, is shewn, at fig. 5, applied to a grand piano-forte, which is represented in longitudinal section, with the "action" removed. In this arrangement it will be seen that the strings pass under instead of (as is usual) above the wrest-plank, which is shewn at *q*, *q*. Immediately over the strings, and in lines parallel thereto, any required number of metal bars *r*, *r*, is placed. These bars are bolted, at one end, to the lining of the case which carries the string-plate *s*, *s*; and near their other ends they are provided with a shoulder, which abuts against the edge of the wrest-plank *q*, *q*, or rather against a strip of angle-iron that forms a protection to the edge of the wrest-plank. The bars extend across this plank, and are firmly secured thereto, as shewn: whereby the wrest-plank is effectually prevented from being drawn out of shape by the pull of the strings. Another advantage afforded by this arrangement is, that the tension of the strings being sustained by what is virtually a metallic framing, possessing the same tendency as the strings to expand by heat and contract by cold, there will, at every change of temperature, be a sympathetic influence in operation between the strings and the resisting medium; and thereby the pitch of the instrument will be maintained, or be but little affected when subjected to a variable temperature. This principle of resisting the pull of the strings is likewise applicable to upright piano-fortes, as represented at fig. 1. In this instance the bars are provided with two shoulders, which pass through the sound-board, so as to get a fair abutment against the angle-iron that protects the edge of the wrest-plank *q*, *q*, and against the string-plate *s*, *s*, respectively. The bars extend across the wrest-plank in the manner and for the purpose before described; and they are secured thereto by bolts, which pass through a strip of angle-iron,

running along the upper edge of the wrest-plank. The lower ends of the bars extend to the bottom of the block which carries the string-plate; and the bars are secured thereto by bolts passed through both the plate and block.

The patentee claims, First,—the mode (as explained in reference to the upright arrangement) of compensating for the varying sensible weight of the hammer, or of that weight which is appreciable by the touch of the performer. Secondly,—availing himself of the sensible weight of the damper for reinstating the jack or hammer-lifter in the notch of the hammer, as explained with reference to the upright action. Thirdly,—weighting the keys or key-levers, in both upright and horizontal instruments, by causing them to sustain the sensible weight of the "action." Fourthly,—the mode of applying the gravitating principle for reinstating the jack or lifter in the notch of the hammer, as shewn in the arrangement for horizontal piano-fortes. And, Fifthly,—the application of the metal bars, as described and shewn, for the purpose above set forth.—[*Inrolled July,* 1852.]

To WILLIAM WHITAKER COLLINS, *of Buckingham-street, Adelphi, civil engineer, for certain improvements in the manufacture of steel.*—[Sealed 24th March, 1852.]

THE improvements in the manufacture of steel, which constitute this invention, consist in treating iron in the following manner:—The puddling-furnace is charged with about 4 cwt. of grey pig-iron, which is melted in the ordinary way, with a large quantity of silicate of iron or other metallic oxide. The first period of the boiling process must be carried on without stirring or raking the melted iron, contrary to the old mode of working, which consists in raking the melted mass immediately; but, according to the patentee's mode of working, the melted mass is left quietly exposed to a very high degree of heat, whereby the impurities, less the carbon, are burned. After this first period of boiling, which is to be continued from fifteen to thirty minutes, according to the nature of the pig-iron employed, the iron will exhibit a tendency to rise up; and then the puddler is to begin to work the metallic mass, and continue vigorously under the action of the highest degree of heat, in order to bring it, as soon as possible, into a fit state to be balled up for the hammer or squeezers and rolls. The product will be close-grained iron of great purity, which, either in the state of mill bars or balled iron finished

bars, will unite with facility with various proportions of carbon. In order to accomplish this, the mill or finished bars of the said iron, without previous cementation, are melted in crucibles, with the addition of carbonaceous substances; and, by this means, cast-steel is produced, adapted for many purposes. The hardness of such steel may be regulated by the employment of carbonaceous substances in a greater or less quantity. A superior quality of cast-steel, adapted for tools, such as chisels, is obtained by melting the said bars of iron with a larger proportion of carbonaceous substances, and then re-melting the product, which is highly carbonized brittle cast-steel, with fresh parcels of the said iron bars.

The patentee claims, First,—the melting iron, obtained from puddling furnaces worked in the aforesaid manner, in crucibles, with the application of carbonaceous substances, either in the state of mill or finished bars. And Secondly,—re-melting the product, so obtained from the crucibles in a highly carbonized state, with fresh quantities of the same iron in the state of mill or finished bars.— [*Inrolled September,* 1852.]

To CHRISTOPHER CROSS, *of Farnworth, near Bolton, in the county of Lancaster, cotton-spinner and manufacturer, for certain improvements in the manufacture of textile fabrics, also in the manufacture of wearing apparel and other articles from textile materials, and in the machinery or apparatus for effecting the same.*—[Sealed 5th September, 1850.]

THE improvements in the manufacture of fabrics consist, firstly, in an arrangement of apparatus constituting a self-acting temple; secondly, in an improved construction of reed for looms, the divisions whereof may be expanded and contracted, so as to suit the same apparatus for manufacturing textile fabrics of various degrees of closeness, with respect to the warp-threads; thirdly, in producing dividing strips, when weaving fustians, by the application of a shedding motion to the warp-threads of such strips, distinct from that which is required for the production of the fustian.

The improvements in the manufacture of wearing apparel and other articles, consist in certain novel methods of employing the machinery and operations of loom weaving for the production of shapes suitable for being made up into trousers, coats, waistcoats, mantles, undershirts, and various other arti-

cles of clothing;—part of the said improvements being also applicable to the making of bags or cases of an irregular figure. This part of the invention consists, firstly, in so regulating the motions of the warp-threads, that, as occasion may require, a part of them only shall be brought into such a position as to become interwoven with the weft, so that a manufactured material may be produced, varying in figure according to the shape of the intended article. By thus dividing the functions of the warp-threads, the operator is enabled to throw the shuttle from side to side of the loom at each pick, but with such partial weaving only as may be required; and thus there is a continuous uniform action, as though the machine were in operation for the production of an ordinary web of cloth; and also the required irregularity of shape is continuously distended as produced, so that the manufactured garment, shape, or other article, may be wound upon the cloth-roller of the loom. Secondly, it consists in another mode of weaving shapes, suitable for being made into apparel, by arranging the warp-threads so as to be capable of producing two or more distinct pieces of cloth, and, for the purpose of gaining the required irregularity of shape, causing one or more of the threads of one set, as occasion may require, to interweave with those of another set: by which means the two (or more) otherwise distinct weavings become stitched together; and, by continuing such stitching along the line of the intended shape, garments are formed, which only require to be joined,—the legs of trousers, for instance. Thirdly, it relates to the production of shapes, to be made up into wearing apparel, by a peculiar mode of combining two or more sets of warp-threads with the weft;—such mode consisting in weaving the required article two or more fold, and combining or keeping separate the said folds, according to the openings or spaces desired: that is to say, in weaving four-fold, for instance, the interweaving of the threads is so regulated that the weft shall be caused, at one time (for example), to traverse the sets of warp which belong to the top and bottom webs of cloth, so as to unite them at their edges; while, at a further stage in the production of the shape, it shall, in like manner, enter into combination with the second and third; or, as occasion may require, with only one, or with the whole of them. Fourthly, the patentee produces irregular shapes, suitable for being made into wearing apparel, by the use of an expanding reed, whereby certain warp-threads are caused to spread out at periods, so as to occupy a more extended space in the direc-

tion of their width, and are contracted again at pleasure: by which means, a woven fabric, of irregular width, is produced, according to the shape required.

The improved temple is shewn in Plate X., at figs. 1, 2, and 3,—fig. 1, being a vertical section; fig. 2, a top view of the stationary part; and fig. 3, a similar view of the bottom thereof. *a, a,* are two plates, turned or otherwise made, so as to be parallel to each other on their inner surfaces, and united by a centre-piece *b,* so as to form a groove *c,* which does not continue in a uniform direction all round, but, at the under part, curves outward, as shewn at fig. 3. Around the two plates *a,* is placed an endless chain *d,* to which are affixed studs *e,* projecting into the groove *c,* so as to form guides, and allow the chain to revolve around the edges of the plate *a,* and follow the direction of the said groove. To the upper part of the chain are attached short spurs *f,* which are intended to take hold of the cloth in process of being woven, so as to keep it distended to the correct width. One of these temples is attached to any convenient stationary part on each side of the loom; and the fabric, as it is woven, arrives in contact with the spurs *f,* which are thus caused to carry the chain *d,* around the peripheries of the plates *a*; the form of the groove *c,* forcing the spurs *f,* outwards, and thus, by drawing the cloth in the same direction, keeping it properly distended.

The improved mode of constructing reeds for looms is shewn at figs. 4, which represent, in two views, a dent, the upper and lower parts whereof are provided with enlargements, which are pierced with holes *a.* Through these holes rods are introduced, of the necessary length to form the required width of reed; and when the dents are thus strung on, the ends are secured by means of screw-nuts, or otherwise. The reed may be made coarser or finer in gauge, by placing washers between the dents, or by removing them therefrom; or should one part of the reed be worn out, fresh dents can be added in such portion.

The improvement relating to the production of strips of separate cloth between portions of fustian weaving, is shewn at fig. 5. The shafts of the usual harness, connected to the warp-threads for the production of the fustian fabric, are shewn at *a,* and are to be worked in the ordinary manner by tappets and treadles. Upon the upper part of the loom is mounted an axle *b,* provided with tappets *c*; above which are treadles *d,* turning upon a centre at one end, and connected at the other to cords, which lead to sets of harness corres-

ponding in number to the separating strips required, and occupying, in those situations, the places of the fustian warp. These sets of harness pass through a comber-board, and are connected at bottom to lingoes. The shaft *b*, and consequently the tappets *c*, have rotary motion communicated to them from any suitable moving part of the loom; and the warp-threads therefore which are connected to the harness attached to the treadles *d*, will receive a shedding motion independent of that which takes place with reference to those used for the production of the fustian cloth. By this adaptation, the operator is enabled to weave separating strips of a regularly formed fabric, and to vary the character of the same by changing the tappets *c*, so as to alter the order of shedding the particular warp-threads governed by them.

The patentee explains his improvements in the manufacture of apparel and other articles by reference to certain diagrams, illustrative of the different methods by which the same may be carried into effect, and as applied to various articles, such as will serve as examples for the production of any required shape. The loom employed may be of any ordinary construction,—the warp-threads being wound upon a beam, and connected to the necessary parts for weaving them, precisely as now practised; and the work also, as it is woven, being taken up in the usual way. Suppose it is desired to weave a shape or shapes suitable for being made into a pair of trousers—one method of effecting this may consist in forming the halves separately. To explain which, let the diagram No. 1, represent one leg, as it would appear when opened out so as to constitute a single cloth. The straight drawn and dotted lines represent the warp-threads of the loom. The threads indicated by the drawn lines are so situate, that each one of the series traverses some portion of the woven shape; and as all these threads are consequently used uninterruptedly, the patentee calls them the "standing warp:" they may be connected to healds and shafts, and a shedding imparted to them according to the fabric to be produced, as in ordinary weaving. The threads represented by the dotted lines (called the "tapering threads") are connected to a Jacquard apparatus, or to any of those contrivances (endless chains or organ barrels, for instance) which are used in place thereof, so as to be capable of receiving a rising or falling motion, independent of the "standing warp." On commencing the weaving of the shape No. 1, the standing warp-threads are shed according to the desired texture of the fabric,—the whole of the tapering threads being raised by the Jacquard or similar apparatus;

the weft is then thrown in as usual, and the shed again made; and so on until the fabric is woven as far as the point *a*, *b*: during the whole of which time the entire series of tapering threads are raised at each pick, to keep them from interweaving with the weft; and a cloth is thus produced by the standing warp only,—the width thereof being from *a*, to *b*. Beyond the line *a*, *b*, a gradually expanding width of fabric is produced, by so arranging the perforations of the Jacquard cards (or the equivalent apparatus) that, instead of keeping up the whole of the tapering threads, a portion of them shall be dropped on either side of the shape in progress of being formed, and have a shedding motion, corresponding to that of the standing warp. This dropping of the tapering warp-threads, or, in other words, bringing them into co-operation with the standing warp, progresses according to the outline of fabric desired; and it may be pursued by causing a thread to come into action at each pick of the loom; or several may be dropped together at convenient intervals. When the work has proceeded as far as the point *c*, *d*, the entire warp will have been brought into operation; and beyond this a narrowing is required: in order to effect which, the tapering threads are gradually kept up by the disposition of the Jacquard cards, or equivalent apparatus, so as to be free from the throw of the weft. The shape thus produced, if folded so as to bring the points *c*, *d*, together, will assume the form represented at No. 2; and when closed by sewing up the leg-part, and another such shape, so woven, attached thereto, a pair of trousers will be formed, with the exception of fastenings and pockets or other openings.

No. 3, represents another mode of forming one half of a pair of trousers,—the shape being produced in the loom with the leg part closed. The shape shewn in the diagram represents the half of a pair of trousers, as it would appear if separated from a perfect pair directly through the middle and laid out flat: in which case, there will be two thicknesses of cloth similar to No. 1, when folded over. In order to carry out this method, the whole of the warp-threads are arranged so as to act in two sets, as is well understood with reference to the production of two pieces of cloth. The two sets of warp-threads are, as before, divided into the standing warp and the "tapering warp;" but, as one side of the intended shape is to be straight, there is a necessity for the tapering warp on one side only: this, however, is divided into sets belonging to the upper and lower cloth, precisely after the same manner as that of the standing warp. The operation by which the irre-

gular figure is produced is precisely similar to that already described; but, in order to unite the two weavings, so as to effect the required closing of the leg, the shedding of the warp is so caused to take place that a thread or threads of the two sets of warp work together at intervals, at points coincident with the outline of the shape to be produced: this union produces a stitching effect, and will form the leg of the trousers entire. Such closing, however, is not required on the tapered side beyond the point *e*; for there it is to be joined to the other half, to form the perfect trousers. The interweaving of the threads of the two sets of warp may also discontinue from *f*, to *g*, which will leave the two thicknesses of cloth detached, so as to form a slit for the pocket. Thus, one half of the entire shape is formed, which, when joined to the other, and fitted with fastenings, trimmings, and any required openings, becomes a perfect garment.

No. 4, represents a mode by which a shape, similar to that already produced, and a lining, may be formed by continuous operation. Suppose the required weaving to have been effected, as before described, the half of the trousers will have been produced when the operation has been continued up to the point *a*; and then similar motions of the warp-threads are to be recommenced, and carried on until another such shape has been produced: this being an exact counterpart of that already woven, will, when turned therein, form a lining exactly suited in configuration. In forming these linings, the shuttle may be changed, so as to throw in a weft of a different material or color, according to the quality or appearance of fabric required. A number of shapes may be simultaneously produced, by arranging the warp-threads in sets, placed side by side, like those of a "tape loom," having a shuttle or shuttles for each set.

No. 5, represents another mode of producing a pair of trousers. In this instance, the perfect shape for being made into the garment is to be woven simultaneously; and as no thread of the warp is required to be in operation during the formation of the whole of the work, the entire series become tapering threads: the operation, however, is like that already described,—the warp-threads which do not join that part of the work then forming being raised out of the range of the shuttle, so as to miss interweaving. Shapes for trousers may be woven, by this last method, in conjunction with a lining, by reversing the motions of the warp-threads; and a shape may be manufactured single, and afterwards joined to a similar half by hand, or may be produced double, and stitched

along the outline, by the union of threads in the two sets of warps.

Shapes for chemises or under shirts, and a variety of other articles, may be manufactured according to these improvements. No. 6, exhibits a shape suitable for a jacket; in making which the tapering threads are removed, as described, so as to form the irregular configuration represented by the full lines; and, subsequently, the part included by the thick dotted lines is cut out. The two portions *a*, *b*, being now brought together and sewed, the orifice for the arm will be formed at *c*: which part of the garment may be manufactured on the principle of this part of the invention, as shewn at No. 7,—the parts included within the thick dotted lines being subsequently cut away. The shape No. 6, may be made in single cloth, and so constitute one half of the shape to be formed into a jacket; or it may be produced double, by the use of two sets of warp-threads, and thus constitute both halves of the body: in which case, threads of the two sets of warp may be united, at intervals, along that part of the shape constituting the back, so as to stitch the two fabrics together. It is preferred to weave the arms, No. 7, in double cloth, and to unite the threads of the two sets of warp along both edges of the shape: whereby that part of the garment will be woven in the required tubular form. A bolster or other case may be produced, with the corners rounded off, by taking up the tapering thread; and it may be woven in double cloth, united around the edges, excepting at any part which may be desired to be left open for the purpose of stuffing, or for other uses.

It will occasionally be found that, owing to the tapering warp-threads not being so much interwoven with the weft, they will become slack; but this may be obviated by placing, at intervals, a packing of cloth or other material, so as to be wound with them on to the work-beam. The shapes, when taken from the loom, will of course have the unused warp-threads hanging to them, which must therefore be removed. It has been stated, that the tapering warp-threads are occasionally raised out of the way of interweaving with the others; but it will be evident, that precisely the same effect may be produced by keeping them, at proper intervals, depressed.

Fig. 6, is a partial front view of a loom, shewing a method of working the tapering warp-threads, and also a peculiar construction of Jacquard apparatus, to be used for regulating the motion of the warp-threads, so as to cause a variation in the manner of combining the several cloths when weaving

more than one fold, as described under the third division of these improvements in the manufacture of wearing apparel, The harness of the tapering warp-threads is denoted by the dotted lines. The upper ends of the harness are connected to thin metal pieces *a,* (one of which is shewn detached, in two views, at fig. 7,) having hooks at the top, and formed with longitudinal slots, through which the rods *b,* are passed: by which arrangement, the pieces *a,* are caused to slide up and down in a parallel direction. Upon the tapering harness are formed long loops *c,* through which the shafts (one of which is shewn at *d,*) pass; and lingoes are applied at bottom in the usual manner. To the upper part of the side framing of the loom are affixed upright pieces *e,* formed with vertical slots, to serve as guides; and within such slots is placed a transverse bar *f,* connected at each side to rods *g,* which extend downwards, and are jointed to cranks upon the crank-shaft of the loom: by which connection, an up-and-down reciprocating motion is given to the transverse bar *f.* Upon the bar *f,* is mounted a plate *i,* which, by means of slots and pins, is capable of moving to or fro in a parallel direction; and one part of this plate *i,* projects beyond the bar *f,* as at *i*,* (see the detached top view, fig. 8,) for the purpose of sliding under the hooks of the pieces *a,* as hereafter explained. *j,* is a cam, which is caused to revolve, at intervals, by a suitable connection with any moving part of the loom; and against its periphery is placed one end of a bolt *k,*—the other end thereof being provided with a boss, through which passes loosely a pin *l,* projecting from the sliding-plate *i.* The rod *k,* moves in guides *m,* and is continually pressed towards the cam *j,* by means of a coiled spring *n.*

The operation of this apparatus is as follows, premising, for the present, that the shafts *d,* have motion communicated to them, in any ordinary manner, for shedding the warp; for, although a peculiar Jacquard apparatus is shewn applied thereto, it is not necessarily employed in conjunction with the tapering motion now referred to, and will therefore be described separately in its proper place:—According to the position of the parts shewn, the plate *i,* has been projected forward by the cam *j,* and has carried its projecting part *i*,* along certain of the series of pieces *a;* so that, upon the upward motion of the bar *f,* those pieces *a,* which were opposite to such projecting part have been raised into the position shewn; and, by this motion, those of the warp-threads which are connected to the harness of the pieces *a,* that have been thus raised, have also been carried upward,—the loops *c,* slid-

ing upon the shaft *d*, and therefore communicating no motion thereto. The tappets or other apparatus, used for shedding the warp, will now come into operation, so as to dispose, in a suitable position, all those warp-threads which are intended to combine with the weft, viz.: the standing warp and such of the tapering warp as have not been moved by the plate *i*. The former (represented by the lines *z*,) being tied to the shaft, in the usual manner, will rise therewith, and the latter will partake of the same motion, by reason of the upper ends of their loops *c**, being suspended upon the shaft. The weft having been then thrown in the usual manner, the bar *f*, will descend during the beating up of the work, until the sliding-plate *i*, shall have gained a position below the hooks of the pieces *a*,—the pin *l*, sliding freely through the socket of the bar *k*. The cam *j*, by means of a ratchet, or other suitable medium, will now be caused to turn a short distance upon its centre, and bring a fresh point of its circumference (say, for instance, a decreased diameter) to act upon the bolt *k*; and this bolt will thereby be made to slide in its guides *m*, and, through the intervention of the pin *l*, carry with it the plate *i*, and bring the part *i**, under the hooks of a less number of the pieces *a*; so that, upon the rising of the bar *f*, more of the warp-threads will be left suspended by the loops *c*, upon the shaft *d*: after which, the shafts will be again caused to operate,—this time, however, acting upon more of the tapering warps, by reason of a fewer number having been selected by the plate *i**; and thus the operation will continue at each revolution of the machine,—the shape of the cam *j*, determining the rate of decrease at which the pieces *a*, and consequently loops *c*, shall be lifted, so as to convey the top ends of the latter beyond the reach of the motion of the shafts. The action of the plate *i**, has been described as decreasing with reference to the hook-pieces *a*; but it will be obvious that such action may at times increase, according to the shape of the cam *j*, and the effect intended to be produced. The tapering warp is shewn applied to one side only; but, if desired, the same adaptation of parts will effect a tapering on both sides of the work; and one or more threads may be connected to each of the hook-pieces *a*. The sliding-plate *i*, is represented in the plan view, fig. 8, as provided with a projecting part *i**, on each side thereof. This arrangement may be used for the purpose of gaining room for the application of a greater number of hook-pieces than could be applied if there were but one such projecting part *i**.

The second method of manufacturing shapes, to be made

up into wearing apparel and other articles, is illustrated by diagrams Nos. 8, to 13. In the first example, No. 8, it is proposed to manufacture a pair of trousers in two parts, to be subsequently joined, as described with reference to No. 3. The loom is furnished with two sets of warp-threads, so as to produce two distinct webs of cloth; but, according to this part of the improvements, none of the warp-threads are to be removed from action; and the shuttle is to be caused to carry the weft-threads, and the warps are to be shed, so as to weave a fabric the whole width of the loom, as ordinarily practised. In order, however, to effect the production of the required shape, the patentee causes a thread or threads of the two sets of warps to combine with each other at intervals along the outline of the shape to be produced. This combination of the threads may be effected by an operation of the Jacquard, or by other well-known methods, so as to unite the two fabrics at the desired parts. In the example under description, the stitching process has been carried on along the thick dotted lines in No. 8, so as to form the outlines of two halves of a pair of trousers, excepting at the parts thereof above the points *a*, *a*; beyond which that portion of the shape commences which has to be subsequently joined to a corresponding half; and the two fabrics are therefore, in that part of the work, left separate: that is to say, the combination of the threads of the two sets of warp, which effects the stitching, has been discontinued. The section of the work, thus produced, will therefore be as at No. 9, if taken in the line 1, 2, and as at No. 10, if taken at the line 3, 4,—the cloths being stitched together to form the legs at *b*, *c*, *d*, *e*, No. 9, and at *f*, *g*, only, No. 10. The shapes having been thus far produced, and others having been woven in succession, if desired, the work is to be removed from the loom, and the shapes cut out by scissors, or other suitable instrument, as represented by the thick-drawn lines in No. 8;—the strips between such lines and those represented by dots being precisely similar to those which would be left by the ordinary operation of sewing by hand. The central line divides the halves which, when joined along the lines *a*, *a*, will form the entire general shape of a pair of trousers, ready for being supplied with fastenings and openings, as may be desired;—the shape so produced being, of course, turned inside out, so as to get the plain seam on the exterior.

No. 11, represents two shapes as being manufactured in the width of the range of warp-threads, and repeated so as to be wound successively upon the warp-beam. The shape B,

may constitute a lining for that seen at A; or it may be another half of the trousers: if the former be desired, then the warp-threads may be of a different material or color, so as to produce a fabric varying from the outside shape A. The stitching is continued, as before, along the dotted lines;—the full lines denoting the configuration to be subsequently cut out.

No. 12, represents a modification of the previously described figures. In this instance, the entire general shape of the trousers is produced in one piece, and pockets are formed therewith. The combination of the threads of the two sets of warp, which produces the stitching, is represented, as before, by dotted lines; and the full lines denote the shape to be subsequently cut by scissors or other instrument. The pockets *a*, are formed in the same manner, and, when turned in, will occupy their proper position; in order to provide for which, the stitching is discontinued at *b*, so that the two fabrics are there kept separate. The space between the legs of the trousers may be appropriated to the production of another shape, as at A, which is supposed to represent the outline of a portion of a waistcoat; and this being woven double, and stitched along the back, forms an entire shape, suitable for being made up into the garment.

No. 13, represents another disposition of trousers shapes. In this case, each form is one half of the entire shape;—a series being woven side by side, in number according to the width of the loom. A number of chemise or undershirt shapes may be woven side by side in like manner.

It has been mentioned, that the stitching together of the threads of separate sets of warp may be effected by the action of the Jacquard or other known machinery. The patentee, however, points out how his improved selecting machinery, already described with reference to fig. 6, may be applied to this purpose. In such case, instead of the projecting piece *i**, being sufficiently wide to take in the width of tapering threads, it must merely be adapted for taking hold of one or more hooks which belong to those warp-threads intended to be interwoven with those of another set,—the cam *j*, advancing the pin *i**, according to the line of stitching required: by this means, the bar *f*, acts after the manner of a loom-shaft, but operates upon selected threads only, varying as may be provided for by the shape of the cam *j*.

The third method of producing shapes, suitable for wearing apparel, is illustrated by diagrams, Nos. 14, to 29. A simple example is given at No. 14, which is a diagram denoting the outline of a pair of loose trousers, with the sides woven

straight, or without taper. This shape is double,—the section thereof, at 1, 2, being as at No. 15, and at 3, 4, as at No. 16; and when folded over, so as to become four-fold, the section thereof at 1, 2, will be as at No. 17, and at 3, 4, as at No. 18. It is in this four-fold form that the shape is produced in the loom, and in the following manner:—The warp-threads are arranged so as to have a shedding motion imparted to them, suitable for the production of four webs of cloth, in a similar manner to the way in which two are woven; and the loom is provided with two shuttles, mounted, if working by power, in a rising box. On the commencement of weaving the shape, the first shuttle interweaves with the warp-threads of the top cloth *a*, and then with the second cloth *b*, for any desired number of picks; after this, the second shuttle is brought into operation, so as to combine with the third cloth *c*, and subsequently with the fourth cloth *d*, which, in their turn, thus become united at their edges; and thus the two legs, being formed by distinct weft-threads, are kept separate. This operation continues until the shape is produced up to the point *e*,—at which point the legs terminate, and the body-part of the garment commences. In order to effect this it will be necessary to alter the combination of the four webs of cloth to such an arrangement, that the first thereof, *a*, shall be joined to the fourth, *d*, and the second, *b*, to the third, *c*, as seen in the section No. 18. The shedding of the warp must therefore be suitably arranged for such purpose: the weft of the first shuttle may then pass along the cloth *a*, return through a shed opened by *d*, and back again in the same course; after which, the weft of the second shuttle may perform the same motions with reference to the warp-threads of the cloths *b*, and *c*; and so on until the entire shape shall have been produced. This operation has been described as carried on throughout by the use of two shuttles, whereby the outside edges will be left open, and may serve for pocket-holes; but, if desired, one shuttle only may be used above the point *e*; and, in this case, the shape will be close all round, and the section, taken at 3, 4, be as at No. 19: for this purpose the function of the weft will be to pass through the shed of the first set of warps *a*, then through those of the bottom set *d*, afterwards through those represented by *c*, and finally returning to the starting point along *b*.

The new apparatus, invented by the patentee for varying the combination of two or more webs of cloth, is shewn at fig. 6, in conjunction with the novel machinery used for selecting the tapering threads. The general arrangement is

similar to an ordinary Jacquard apparatus; but, as the object is to lift the shafts of the looms, instead of one or a few warp-threads, the parts must be made upon a correspondingly strong scale. The needles *p*, pass freely through holes in a frame *q*, and also through vertical slots *r*, in the sides of a box *s*; and upon the needles there are projecting pieces *t*, between which and the frame *q*, are placed spiral springs. The hooks *u*, pass through the needles as usual, and also through a guide-plate *v*; and to their lower ends are fastened cords *w*, *w*, which, after passing over guide-pulleys, are connected, respectively, to each end of a shaft, as at *d*, *d*. The frame *q*, is loose within the box *s*, and capable of being moved up and down therein by means of cords or chains *x*, and is caused to effect such motion in a parallel direction by means of guide-pieces. The Jacquard cylinder *z*, is formed with holes, as usual; and the cards or plates, which pass around it, are to be pierced in like manner, according to the movements to be produced. Suppose, however, for example, that such cards or plates are provided with piercings making three deep in a vertical direction, motion being communicated to the cylinder by any of the usual methods, the needles will be pushed back or remain stationary, so as to allow of the hooks being raised by the knife, or kept down, as ordinarily practised; and thus the motions will continue until it is desired to effect a change in the order of shedding the warp;—the needles *p*, being operated upon by the line corresponding to the bottom tier of card piercings only. When such alteration however is desired, the frame must be raised by pulling the cord or chain *x*, until the row of needles is brought opposite to another range of holes of the endless cards or plates; and each revolution of the card cylinder will then effect a course of shedding different from that which previously took place. In order to illustrate this fully, the patentee refers to the diagrams Nos. 14, 18, and 19:—here it is necessary, in the first instance, so to regulate the motions of the warp-thread, that the weft, having interwoven with the first cloth, shall then combine with the second; and a similar operation is then to take place with reference to the third and fourth cloths: this effect is supposed to be produced by one revolution of the chain of cards or plates,—the needles being opposite to the bottom range of holes. The weaving having advanced as far as the point *e*, No. 14, a change becomes necessary, as it is now desired to combine the first cloth with the fourth, and the second with the third; the attendant will therefore stop the loom, and, by pulling the cord or chain *x*, raise the

frame, and, consequently, the needles *p*, until they shall have been brought to a line coincident with the second range of piercings in the cards or plates. The weaving will now go on according to the altered routine of card-piercings, combining the several cloths, as required, until they shall have been manufactured to that point where the openings for the pockets are required; and then the frame *q*, and its needles are again to be raised, so as to bring them into contact with another part of the cards, to effect a course of shedding that will combine the cloths as at No. 18.

The patentee next points out how the several methods of producing shapes, as aforesaid, may be used in conjunction. No. 3, represents a shape similar to that assumed by a pair of trousers when folded one leg on to the other: in which case, there will be four thicknesses of cloth. The outline of the shape is effected by the agency first described, viz., by raising or lowering certain of the warp-threads out of the way of the weft;—the weaving of the legs is effected by the use of two shuttles, in the manner explained with reference to No. 14; and the body part is produced also by the same method,—the sections at similar points corresponding to those exhibited at Nos. 17, and 18. In this case, therefore, the entire general shape of the trousers will be produced, but closed up all round. If it be required to form an opening up the front, then the section of the four-fold cloth, taken above the point *e*, will be as at No. 20; and the shedding of the warp must from that position be so arranged as to prevent the cloths from being combined as heretofore. For this purpose, the motion which governs the rising and falling of the shuttle-box may be thrown off, so as to allow one only to carry its weft-thread across the loom; combining it, firstly, with the cloth *a*, then with the cloth *d*, after which, along *c*, and back again in the same direction,—finally passing along *b*, and gaining the starting point by again traversing the said cloth *b*. If it be desired to have an opening at each side for a "full fall," then the operation will be the same as described in reference to No. 18. Should it be required to form an opening up the front, as well as at each side (the latter being for pocket-holes), the section of the four-fold cloth will be as at No. 21. In this instance, it will be perceived that there are three cloths, distinct from each other; and there must therefore be three shuttles employed, so as to preserve the required openings: the first shuttle will combine its weft at the first pick with the cloth *a*, and next with the fourth *d*, and repeat backwards the same operation; the second shuttle

will then traverse the second cloth *b*, forward and backward; and the third shuttle, in like manner, will act in combination with the third cloth *c*.

No. 22, will illustrate the production of a shape by combining the three methods of operating before described. In this instance, two pairs of trousers-shapes are woven side by side, and upon the four-fold plan. The irregular configuration of the leg part is produced by the tapering warp-threads; and the straight sides thereof are formed by the method of stitching the warp: between such straight sides, therefore, there will be strips of cloth, which are to be separated in the middle by cutting subsequent to the weaving. No. 23, is a section of the manufactured shape, taken in the line 1, 2, of No. 22; and No. 24, is a similar view, taken in the line 3, 4. In manufacturing trousers-shapes, according to this plan, the first shuttle will traverse the top cloth and back again along the second cloth; and, at the same time, one or more warp-threads, of the two cloths, will be worked at *c*, *c*, so as to form, by stitching, the other edges of the shapes. The like operation will then take place with reference to the second shuttle, which, by working in combination with the third and fourth cloths, produces the other legs of the required shape. Above the point *e*, the order of shedding the warp will be changed, so as to cause the shuttle or shuttles to interweave the weft with the several sets of warp-threads, according to the closings or openings required, as described with reference to Nos. 17, 18, 19, 20, 21;—the stitching between the first with the second, and the third with the fourth cloths being continued or left off, according to the required closing or opening. For example, should it be desired that above the point *e*, an opening should be left up the middle in front, and also that slits are desired at the sides, to constitute pocket-holes, the section across that part of the shape, No. 22, marked 3, 4, must be like that represented at No. 25;—the stitching must be discontinued from the point where the pocket-hole begins; and it will be necessary to employ three shuttles, the first appropriated to *a*, and *d*, cloths, the second to *b*, and the third to *c*. The several shuttles will, however, when thus working, combine the cloths of the two pairs of trousers,—that is to say, webs of cloth will be formed, extending across the two shapes: in order, therefore, to separate them, they must be cut in the directions shewn by the dotted lines in No. 25; or the incision may be made at the centre of those two lines, and the superfluous part used for being turned in when the shapes are made up.

No. 26, represents a shape suitable for a chemise or under-shirt, and is supposed to be made two-fold, according to the combined operations of the second and third improvements. The section of the completed shape, taken in line 1, 2, will be as at No. 27, and a similar view at 2, 3, will be as at No. 28. The tapering being effected as before, and the operations generally the same, it will only be necessary to remark, that one shuttle is employed for forming the lower part, No. 27, and two for keeping the arm-holes open, as at No. 28.

The fourth mode of manufacturing shapes, as aforesaid, the patentee explains by reference to figs. 9, and 10. The reed-dents are shewn at *a*, mounted upon rods *b*, *b*, as described with reference to fig. 4; and between each dent and the next, at the upper and lower ends, is placed one of a series of circular wedge-formed pieces *c*, *c*, the two sets of which are mounted so as to slide loosely upon axles *d*, *d*, (as shewn in the detached fig. 10,) and are capable of turning in suitable bearings. The axles *d*, *d*, are provided with toothed pinions *e*, *e*, which are connected, so as to partake of corresponding motions, by a toothed wheel *f*; so that, by turning this wheel, the circular wedges will be caused to revolve, and bring an increased or decreased thickness between the dents of the reed, so as to expand it or contract it at pleasure; and, by thus operating, the threads are caused to occupy a variable width, and so produce an irregular breadth of cloth, according to the shape required. In order to force back the dents and circular wedges from their expanded position, springs or weights are applied at one or both ends of the rods *b*.

In conclusion, the patentee states, that many modifications may be effected without departing from the spirit of his invention. He claims, Firstly, as a temple, applied to looms for weaving,—the use of the endless travelling chain and its points, so arranged as to draw the cloth outward, at the same time presenting a flattened surface of the said chain thereto. Secondly,—so constructing the reeds of looms, that the dents thereof may be shifted nearer to or further from each other; or a portion of them removed for the substitution of others. Thirdly,—the production of dividing strips of calico or other cloth simultaneously with the weaving of fustians, by the application of a shedding motion, distinct from that which operates upon the warp-threads of the fustian.

With reference to the improvements in the manufacture of wearing apparel, the patentee claims the production of shapes, Firstly,—by so governing the action of the warp-threads,

through the agency of a Jacquard or other apparatus, that a portion of them, as occasion may require, shall be prevented from the usual operation of shedding, so as to fail in combining with the weft, although the shuttle or shuttles shall travel from box to box,—thus producing an irregular quantity of work in the direction of the width of the loom. Secondly,—by arranging the warp-threads so as to be capable of producing two or more pieces of cloth, the whole width of the warp-threads, and uniting certain of the respective threads of such otherwise separate pieces of cloth by means of the Jacquard or other apparatus, so as to form the required shape. Thirdly, —by arranging the warp-threads, so as to produce two or more distinct pieces of cloth, and causing the weft to traverse them separately, or to unite two or more of them. Fourthly,— by causing the dents of the reed to expand or contract, so as to cause the warp-threads to occupy a space of variable width. Fifthly, for the production of shapes, as aforesaid,—the use of the sliding-plate, described with reference to fig. 6, which, by selecting certain of the warp-threads, prevents them from being shed by the action of the shafts; or, according to the second method, combines certain of them, in order to effect the required stitching. Also, for the like purpose, he claims the arrangement of the Jacquard apparatus represented at fig. 6,—such arrangement consisting in the application of a row or rows of needles, capable of being shifted so as to act in combination with different portions of the chain of cards or plates.—[*Inrolled March,* 1851.]

To Jean Antoine Farina, *of Paris, in the State of France, proprietor, for a process for manufacturing paper.*—[Sealed 13th January, 1852.]

This invention is stated to consist in a certain process by which a pulp may be made from a plant called "spartum" [*spartium*] or "water broom"; and which pulp may be manufactured into paper by any of the methods employed in making paper from the pulp of rags.

The preparation of the pulp is effected by the following series of operations:—The first is a preliminary operation. The root of the plant being harder to treat than the stems, it is separated therefrom, and set aside for a suitable mode of treatment, hereafter described; and the stems are cut into pieces from 4 to 6 inches in length.

The second operation is the barking or stripping, the object of which is to open or bruise the gummy envelope that sur-

rounds and unites the textile matter of the plant, and to detach it as much as possible. This is effected by subjecting the stems to the action of a carding machine, in which the point-plates of the great drum have been removed, and "wolf teeth" (*i.e.* teeth turned down at the end) substituted for the same. These teeth should project from 2 to 2½ inches from the drum, and should be arranged chequerwise, about 1 inch apart. Below the drum there are three cross-pieces, which are likewise furnished with wolf teeth.

The third operation is the steeping, which is performed as follows:—The stems, having been barked or stripped, are put into an oak vat, provided with a steam-tight cover, and of sufficient capacity to contain from 10 to 12 cwt. of material. A sufficient quantity of water is poured in to completely cover the material; then American potash is added, in the proportion of about 2 per cent. of the weight of the stems in the vat; after which the cover is hermetically closed, and steam admitted for about 4 hours. When the plant has become cold, it may be removed from the vat; and the water which has been used for steeping it may be employed again for treating a similar quantity of stems, by the addition of about half the original quantity of potash.

Fourth,—the crushing operation. The stems are taken wet from the steeping vat, and subjected to the action of a fulling mill, or of a vertical mill-stone rolling upon its axis in a stone trough. Care must be taken to turn the stems continually, and to keep them constantly wetted. This completes the separation of the gummy parts from the filamentous portions of the plant.

Fifth,—the washing operation. This is performed in washing stocks, which are capable of holding from 2 to 3 cwt. of the material, and are preferred to be 6 yards long, 5½ feet wide, and 2¾ feet deep. The cylinder should be furnished with blades of tempered iron, about ¼ inch thick, rounded at the points, projecting about 2½ inches from the surface of the cylinder, and placed about 2 inches apart from each other. Instead of a casing, there should be two washer-drums. The first washing occupies about a quarter of an hour; and then there is added to the above-mentioned quantity of material a quart of nitric or sulphuric acid, or two quarts of muriatic acid. The water supply-cock is then closed,—the apparatus still revolving; after which, the material is again washed for about 10 minutes; and then it is removed from the stocks.

Sixth,—the carding operation. The material, on being taken from the washing stocks, is in a state resembling tow; and,

when dry, "it is carded by a card similar to that used for hemp and flax":—the product is called by the patentee, rough hemp.

The seventh operation, which is the bleaching of the material, may be performed in two ways. According to the first method, a quantity of the hemp is put into a wooden vat and covered with liquid chlorine, of the strength of at least 10° or 12° Baumé (the material being well stirred with a spatula); at the end of 10 minutes, about a pint of nitric acid is to be very gradually added; and then the vat is closed and the hemp allowed to remain therein until it has assumed a good white color. In the second plan, the hemp is placed in thin layers upon shelves within a closet which can be closed hermetically; then a vessel is introduced, containing about 2¼ lbs. of chloride of lime for every hundred-weight of hemp in the closet; and the closet is carefully closed. Above the closet is placed a vessel containing white nitric acid, in the proportion of 1 quart of the acid to 4½ lbs. of the chloride of lime; and the acid is caused to fall very slowly upon the chloride of lime, so that the flow of the acid will last from 6 to 8 hours. On the addition of the acid, a disengagement of gas ensues, which fills the closet and bleaches the hemp.

Eighth,—the washing operation. It is now requisite to wash the hemp, in order to get rid of the nitric acid, which after some time would turn the material yellow and injure its tenacity. The hemp is therefore placed in a "cylinder mortar," of the same dimensions as the washing stocks, and having its bed fitted with flat blades. This apparatus, besides washing the bleached tow and hemp, serves also to untwist it and reduce it to a pulp, which only requires to be drained and dried, to render it fit for packing up in bales, or for being manufactured into paper by any of the ordinary methods of making paper from rag-pulp.

Preparation of the roots.—As the roots are shorter in fibre and harder than the stems, the patentee does not employ the "wolf card" to them, but only crushes the same in the stocks or vertical mill. The remaining operations are similar to those already described; but the mechanical and chemical actions require to be more energetic: thus, soft soap may be substituted for American potash; the steeping may be prolonged to 6 hours; and the heat should be carried as high as possible. In no case, however, will the pulp obtained from the roots of the plant be so white as that prepared from the stems; and it is therefore only suitable for the coarser kinds of paper.

In conclusion, the patentee remarks, firstly, that the carding is not indispensable, and may, in the absence of the carding apparatus, be omitted. Secondly, if the material, after the steeping, and before being subjected to the stocks or vertical mills, be piled in heaps of 10 or 12 cwt. each, and left for 8 or 10 days, the filaments are separated more easily, and the bleaching is better and more quickly effected. Thirdly, ordinary potash may be substituted for American potash; but one-third more of it must be employed, and the bleaching will proceed more slowly. Fourthly, the pulp may be rendered more white by the addition of a few buckets-full of liquid chlorine in the cylinder mortar. Fifthly, for the same purpose, the liquid chlorine may be saturated with concentrated nitric acid, in the proportion of 1 gallon of acid to 100 gallons of chlorine. Sixthly, the chlorurated and acidulated waters which have served for one bath, may be employed for a second and a third bath; but allowance must be made for the absorption of the liquid by the material; and therefore there must be an addition both of the liquid chlorine and of the nitric acid; and the tow or hemp must remain longer in a bath which has been used before. Seventhly, in the manufacture of the pulp into paper, the beating should be gentle,—that is to say, the cylinder of the beating engine should not be very close to its bed, and the teeth of both should not be very sharp. Lastly, according to the quality of pulp which is required, and also according as the machine may have more or less triturated the pulp, it may be either too dry or too rich;—in the first case, cotton rag pulp should be added; and, in the second case, linen rag pulp should be added, in the proportion of about one-fifth of the other material: in any case, the addition of a portion of rag pulp to the spartum pulp (which is very tenacious) will render it more supple and more suitable for the manufacture of paper.

The patentee claims, First,—the preparation of pulp from the plant called spartum or water-broom, for the manufacture of paper, by means of the whole of the operations above described and set forth, or with the omission of the second and sixth operations. Secondly,—the employment of American or other potash in the preparation of pulp from spartum, as mentioned under the third operation. Lastly,—the employment of nitric acid in the preparation of pulp from spartum, as described under the fifth and seventh operations.—[*Inrolled July,* 1852.]

To Jean Theodore Coupier *and* Marie Amedee Charles Mellier, *of Maidstone, in the county of Kent, Gentlemen, for certain improvements in the manufacture of paper.*—[Sealed 23rd February, 1852.]

The first part of this invention is more especially applicable to the treatment of straw and generally the herbaceous matters and the barks of some trees, such as willows, osiers, chesnut-trees, and others; and it has for its object to make pulp therefrom, by chemically acting on the same, as hereafter described, and so dispensing with the use of the machinery heretofore employed for reducing such matters to pulp. It consists in employing a solution of hydrate of soda or potash, of such strength and in such manner as will, with the other means hereafter described, reduce the vegetable matters into pulp, suitable for making paper.

Straw or similar vegetable matter is to be cut into small pieces by a chaff-cutting machine, and bark or such like vegetable matter is to be cut into chips, or crushed; and the vegetable matters are then to be subjected to the action of a boiling solution of hydrate of soda or potash, of from 7° to 10° Baumé. The straw or other matter is put into a tub or other vessel, having a perforated false bottom; through the cover of which vessel a pipe enters, and terminates in a rose-head; and the other end of the pipe enters into a close iron vessel, and descends nearly to the bottom thereof. Into this iron vessel, which is capable of holding about 60 or 70 gallons, the alkaline solution is introduced, and is kept boiling therein by means of high-pressure steam, passing through a worm in the vessel; and, by a slight escape of steam from the worm, the solution is forced up the pipe and through the rose-head, falling in streams upon the straw or other vegetable matter in the tub. When the iron vessel has been emptied in this manner, it is again filled with the solution, and so on, until the proper quantity has been forced into the tub: which will be from 30 to 40 gallons for each hundred-weight of vegetable matter. A circulation of the liquor is now caused to take place by the following means:—From the bottom of the tub, which is raised a few inches above the top of the iron vessel, there proceeds another pipe, having a cock upon it, and furnished with a self-acting valve, opening into the iron vessel; through which a quantity of the liquor is returned to the iron vessel, on the steam being turned off; and then when the steam is turned on again, to drive over the liquor, the valve is closed by the pressure of the steam, so as to prevent the

liquor from being forced under the false bottom, instead of being thrown on to the straw from the rose-head. When this circulation has continued for 8 or 10 hours, the cock on the return-pipe is closed, and the liquor is drawn off by another pipe at the bottom of the tub. Water is then run into the iron vessel, and forced by steam through the pipe on to the straw; and such operation of washing is to be repeated until the water that comes off is not of a greater strength than 1° Baumé. After this, cold water is to be run into the tub, till it comes off clear.

The vegetable matter is now put into a bath of hypochlorite of alumina, in order that it may be bleached and its fibres disaggregated; and it remains therein for 12 or 13 hours,—being stirred from time to time. The hypochlorite is employed in the proportion of from 20 to 25 per cent., by weight, of the vegetable matter; and about 70 gallons of water are used for each hundred-weight of vegetable matter: the solution will therefore be about 3° Baumé. A solution of other hypochlorites, of like strength, may be used. The vegetable matter having been thus reduced to what is called "half stuff," of good color, the liquor is to be strained off; after which, the pulp is to be well washed (by preference, with boiling water), in order to free it from the hypochlorite and complete the disaggregation of the fibres; and then it is to be put into an ordinary beating engine, and made into paper, either alone or combined with rag-pulp.

In order to carry out this part of the invention with economy, the alkaline liquor (drawn off from the tub) and the first wash-waters are evaporated; and a "resinous soap" is thus produced, from which, alone, or mixed with charcoal-dust or sawdust, gas may be obtained by destructive distillation; or it may be burned as fuel, and from the ashes a considerable part of the alkali may be obtained by lixiviation.

The patentees remark, that "the above described process is also applicable to flax-waste, cotton-waste, tows of hemp, jute, or surate; but this does not dispense reducing them in half stuff by the means usually employed."

The second part of the invention consists in employing nitric acid, of such strength and in such manner that wood may be reduced to pulp thereby and bleached, without the necessity of mechanical operations; and, by operating in the manner hereafter described, other useful products are obtained.

The wood must be reduced to shavings before it is treated according to this part of the invention: beech, ash, and elm

are particularly suitable for being converted into pulp by the new process. In operating upon the wood, two tubs are used, each having a perforated false bottom, on which the shavings are pressed; and upon these is placed a perforated cover, leaving a space of about 8 inches between such perforated cover and the close cover placed on the top of each tub. White nitric acid (36° Baumé) is used in the proportion of 80 per cent., by weight, of the vegetable matter to be operated on; and such acid is mixed with water, so as to reduce it to about 5° or 6° Baumé. The proper quantity of diluted acid is run into one of the tubs, and allowed to act on the shavings for about 4 hours; and then it is brought to and kept in a state of ebullition, by means of free steam, for about 2 hours: during which process, fumes of nitrous acid pass off and are introduced into the other tub, below the perforated false bottom, by means of a pipe affixed to the cover of the first tub. The shavings in the second tub (which have been previously damped) are thus subjected to the fumes of nitrous acid; and a stream of atmospheric air is, at the same time, forced into the tub, below the false bottom, in order to convert part of the fumes into hyponitric acid. When the liquid has been drawn off from the shavings in the first tub, they are to be well washed with water, and then subjected to the action of a solution of hydrate of soda or potash, of about 2° Baumé. In this solution the shavings are to be boiled for about 2 hours; then they are to be well washed with water; and, after this, the fibres of the wood are to be treated with hypochlorite of alumina, as before described—except that the hypochlorite is used in the proportion of 2 per cent., instead of 25 per cent. The pulp produced is to be well washed, and then it is ready for use, either alone or combined with rag-pulp.

The liquor drawn from the first tub is to be put in the second tub, into which the fumes of nitrous acid from the first tub have passed,—such liquor being strengthened by an addition of nitric acid, in the proportion of 40 per cent., by weight, of the raw material. The operation is then to be carried on in the manner before described, and the fumes of nitrous acid conducted into the first tub, which has again been filled with damp shavings. In this way the liquor may be employed several times, until it becomes too thick; then it is to be evaporated in an earthenware vessel, heated by a water bath; and, on cooling, crystallized oxalic acid will be obtained, which may be purified in the ordinary manner; and the mother waters will contain another acid, analogous to nitro-picric acid, which is suitable for dyeing woollens and silks.

The patentees claim, First,—the mode, above described, of reducing vegetable matters into pulp by means of a solution of hydrate of soda or potash, and the use of hypochlorites;—and they also claim the mode, above described, of employing hypochlorite of alumina for bleaching vegetable matters in the process of manufacturing paper. Secondly,—they claim the mode, above described, of employing nitric acid in manufacturing pulp and obtaining other products.—[*Inrolled August*, 1852.]

To Richard Ford Sturges, *of Birmingham, in the county of Warwick, manufacturer, for an improved method or improved methods of ornamenting metallic surfaces.*—[Sealed 24th January, 1852.]

The improved method of ornamenting metallic surfaces, which constitutes this invention, consists in the use of designs made of wire, sheet metal, thread, lace, paper, or other fabric or material, placed between two plates or sheets of metal, and subjected to pressure between rollers or otherwise, whereby the design is impressed upon the plates or sheets.

The designs may be continuous (*i. e.* repeated an indefinite number of times upon a long sheet of metal), or central (the design being confined to one part), or partly continuous and partly central,—that is, one part may be impressed upon the whole surface of the metal sheets or plates, so as to constitute a ground pattern, and the other portion may be confined to one part of the sheet or plate. Wire designs may be made by bending or working the wire into the desired pattern, either by hand or machinery. Thread designs may be worked by hand or machinery; and the designs in thread met with in commerce, such as lace, muslin, or other ornamental fabrics, may be used for impressing metallic surfaces. Designs of sheet metal or paper may be cut out or pierced by any of the ordinary methods. The patentee sometimes combines patterns or designs of lace or wire-work with patterns or designs of paper or sheet metal: for example, he places upon a piece of lace the design of a shield or crest, or some central ornament, such as a group of flowers, and, by pressing the same between the plates of metal, he obtains ornamental surfaces, having a ground pattern like that of the lace, with a central ornament left more or less plain. Sometimes the patentee uses patterns or designs made of paper or sheet metal, or sheets of other substances or fabrics, on which designs have been made in relief by writing or painting; and he finds that

such designs, although slightly in relief, and of but moderate hardness, may be readily impressed upon metal.

The modes of applying pressure, to effect the object of this invention, will vary; but the methods which have been found to answer are—rolling, pressing by presses, and stamping. The metals which are suitable for being ornamented by the above process are—gold, silver, copper, iron, tin, and lead, tinned iron, and the alloys of metals called brass, German silver, and Britannia metal.

Instead of placing a pattern or design between two plates or sheets of metal, and obtaining an impression on each plate, only one plate or sheet to be ornamented may be operated upon; and the said plate, with the pattern or design placed thereon, may be passed between rollers or otherwise pressed; or the pattern may be placed between the plate of metal to be ornamented and a plate of hardened steel, or other hard surface, and the whole subjected to pressure.

The patentee claims the ornamenting of metallic surfaces by impressing patterns or designs made of metal, paper, or other material or fabric, upon the said metallic surfaces,—whether the said designs be formed of any of the materials or by any of the methods above described, or of other materials, or by other methods; and whether the pressure be applied by any of the methods above described or by any other means; and whether the surfaces impressed be of the metals and metallic alloys before enumerated, or of other metals or metallic alloys.—[*Inrolled July,* 1852.]

To ALFRED VINCENT NEWTON, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in dyeing textile fabrics,—being a communication.*—[Sealed 10th December, 1851.]

THIS invention relates to a means of producing stripes and repetition patterns or designs along the whole length of piece goods, by the use of the dyeing in lieu of the printing process. The apparatus used for this purpose may also be employed for producing patterns or designs across the fabric, or from selvage to selvage; and thus fabrics may be dyed with a check or plaid pattern upon them. The fabric to be dyed is lapped or folded over and under frames, the surfaces of which, in contact with the fabric, may be formed to any desired pattern. Each fold of the fabric is embraced by two

counterpart pressing surfaces; and those parts of the fabric which lie between the counterpart pressing surfaces are so tightly held as to be impermeable to the action of the dye-liquor, when the frames (tightly bound together, and retaining the lapped or folded fabric) are immersed therein. In order to continue the pattern along the whole length of the fabric, without any break being made in the line of pattern, end frames, having elastic surfaces, are brought into close contact with the parts of the fabric which lie against the ends of the frames, so as to act as counterparts to the surfaces at the ends of the frames with which the fabric is in contact. By this means, therefore, the fabric is held between continuous lines of counterpart contact surfaces; and thereby a continuous pattern will be obtained on the immersion of the fabric in the dye-bath.

Plate IX., contains several views of the kind of apparatus by which it is proposed to carry out this invention; but the patentee does not confine himself to the use of the construction of apparatus shewn. The frames, over which the fabric is to be folded, are constructed, by preference, of plates of zinc, with parallel bars of wood affixed thereto on one or both sides of the plates. Fig. 1, represents, in cross section, several of these frames, marked *a, a,* piled one above the other, with the fabric lapped between them; fig. 2, is an elevation of one of the end frames *b*; and fig. 3, is a longitudinal section of the frames *a, a,* and *b, b,* combined. These frames are suitably formed for producing stripes or checks at equal distances apart from end to end of the fabric.

In carrying out this invention, one end of the fabric is laid first over a frame containing but one set of bars; a double frame, formed of a plate carrying bars on both sides, in exact coincidence with the bars of the first plate, in respect of shape and relative distance apart, is then laid on the fabric; the fabric is next folded over this frame, and a second frame, of like construction, is superimposed; and the folding of the fabric, and the addition of a double frame, is repeated until the whole length or amount of fabric required to be dyed in one batch is folded up. A single frame, composed of a plate with bars on one side only, is laid on this pile; and then top and bottom boards being added thereto, binding screws and clamps are applied, as shewn at *c, c,* fig. 4, for holding the pile of frames firmly together. It will be understood, that the relative positions of all these frames must be such, that the contact surfaces of the frame on one side of a lap or fold of the fabric will coincide with the contact surfaces of the

frame on the opposite side of the same lap or fold of the fabric, in a manner precisely similar to that of a die and its counterpart, when adjusted for use. The fabric being now confined in folds between the frames *a, a,* it is necessary to protect the parts of the fabric which lie against the ends of the bars, from the action of the dye-liquor. For this purpose, the end frames *b, b,* are applied. The pressing face of the bars of these frames is covered with India-rubber, or other analogous elastic substance; and the position and form of these bars is so adjusted that they will correspond with and form a counterpart to the lines of contact surface presented to the fabric by the ends of the frames *a, a.* To keep these end frames *b, b,* in their place, clamps and binding screws are employed, as shewn at fig. 4; and when the elastic surfaces are made to bear sufficiently hard against the fabric to render it at such parts impervious to the dye-liquor, the combined mass of frames and folded fabric is ready for immersion in the dye-bath. The dye-bath having been prepared, say with red liquor, the folded fabric, held tightly between the frames, is immersed therein; and, after remaining a sufficient time to take up the coloring matter, it is removed, and placed so that the extraneous liquor may drain away or evaporate. On removing the frames *a,* and *b,* the fabric will be found to have been dyed from end to end in parallel stripes, as indicated in the diagram, fig. 5. When it is required to cross these stripes and produce a check or a plaid pattern, the fabric, instead of being folded lengthwise over the frames *a,* is wound transversely between them; the frames are next clamped, as before; and the whole mass is then immersed in the dye-bath. In this instance, no end frames *b, b,* are required; but it should be borne in mind that, to ensure the cross stripes being all of equal width, it is necessary that the sides of each frame, over which a lap of fabric is made, should present a breadth of surface equal to the width of stripe desired to be produced. If the fabric, thus confined between the frames, is immersed in a dye-bath, the pattern shewn at fig. 6, will be produced.

From what has been already stated, it will be evident that patterns of various kinds may be produced on the fabric by this improved mode of working. Thus, supposing it is desired to ornament a fabric with either of the devices shewn at figs. 7, and 8, this may be readily done by forming a model of the device (and, if necessary, a counterpart in reverse), and casting the same in type metal, or otherwise. Copies of the device are then arranged upon frames at proper distances apart; and in like manner the counterpart copies are arranged;—so

that, when the fabric to be dyed is laid between the frames, the metal blocks forming the pressing or contact surfaces will come together in pairs (after the manner of a die and its counterpart), as shewn in the elevation, fig. 9, and prevent the action of the dye-liquor on the parts of the fabric confined between the pressing surfaces. When it is required to produce a pattern which shall shew the ground of the fabric within it; or, in other words, to produce a device in outline, such as that shewn at fig. 8,—it is necessary to make a passage for the entrance of the dye-liquor into the hollow of the pattern-block. The manner of effecting this is shewn in the detached view, fig. 10, which represents the block for the device in question with a saw-cut made in it. When therefore it is applied to the frame, the dye-liquor will readily enter the block, and die the fabric which lies over the hollow in the block,—those parts only of the fabric which are in contact with the pressing surfaces being protected from the action of the dye-liquor. It will be seen in fig. 9, that the ends of the frames *a, a,* are provided with pattern-blocks, and that the end frames bear with their elastic surfaces against these blocks, for the purpose of stopping out the required pattern.

As a modification of the above described plan of producing ornamental devices upon cloth, it is also proposed, in place of counter-blocks, to produce the required pressure on the fabric, at the parts where it is in contact with the pattern-blocks, by the use of elastic surfaces of India-rubber, or other analogous material.

The patentee claims, First,—the employment of continuous lines of contact pressing surfaces for stopping out any required pattern in fabrics, when submitted to the dyeing process; and, Secondly,—the use of blocks or other pressing surfaces containing ornamental devices, when applied in the manner and for the purpose above set forth.—[*Inrolled June,* 1852.]

To Clemence Augustus Kurtz, *of Manchester, manufacturing chemist, for an improvement in all preparations of every description of madder roots and ground madder, in or from whatever country the same are produced; also of munjeet, in the root and stem, from whatever country.*— [Sealed 17th April, 1852.]

This invention consists in preparing madders and munjeet, by combining therewith preparations of liquor which will tend to produce fermentation, as hereafter explained.

The liquor is first made in the following manner:—Twenty pounds of crushed malt are boiled in one hundred gallons of water from twenty to thirty minutes; after which, about forty-five pounds of bran are stirred in, and the liquor allowed to stand until the malt and bran fall to the bottom; and then the clear liquor is run off, and the remainder filtered. From sixty to sixty-five gallons of the liquor are added to one hundred gallons of water, which is of such a temperature that the mixture will be about 112° Fahr. This liquor is put into a vessel capable of containing from two hundred and sixty to three hundred gallons; and about three hundred-weight of madder or munjeet are added, and the whole stirred at intervals of from ten to fifteen minutes, until it becomes a homogeneous mass: this is to be left to rest till symptoms of fermentation present themselves, which are to be checked by repeated stirrings during a period of from sixteen to eighteen hours. The mass is then to be filtered, pressed, dried, ground, and packed in the usual way.

The patentee remarks that, in place of malt and bran, other grain or matters may be employed in preparing a mash or liquor which will tend to produce fermentation in like manner; but he believes that malt and bran are the best for the purpose. He further observes that, although he has been particular in stating the materials and exact quantities and temperatures according to the best of his knowledge, he does not confine himself thereto; as they may be varied without departing from his invention, so long as extraneous matter be employed to induce fermentation.

The patentee claims, as his invention, the mode of preparing madders and munjeet above described.—[*Inrolled October*, 1852.]

To JOHN BRAZIL, *of Manchester, Gent., for certain improvements in dyeing and in the preparation of dye-woods.*—[Sealed 24th June, 1851.]

THE first part of this invention consists in the employment of soap or saponaceous compounds in water to liberate the coloring matter of madder, garancine, or other "dye-stuffs," in the process of dyeing. The proportions which have been found to answer are as follows:—Half a pound of soap (by preference, palm oil soap) is employed for every ten pounds of madder, and to the mixture is added the usual quantity of chalk; or, for the sake of economy, the patentee uses about half or two-thirds of the soap liquor from the beck or vat in which the

pieces of goods or fabrics have been soaped the first time, instead of the first-mentioned soap. In either case, the madder is added to the soap liquor before introducing the fabrics into the dye-vats; and it is preferred to introduce them into the dye-bath when the latter is at the temperature of about 70° or 80° Fahr., and to raise it to 180° in about an hour and a quarter.

This invention consists, secondly, in using borax, either separately or in conjunction with soap or other saponaceous compounds, in water, in order to liberate the coloring matter of madder, garancine, or other dye-stuffs, in the act of dyeing. The following are suitable proportions:—Twelve pounds of madder, half a pound of soap, and a quarter of a pound of borax, with the usual quantity of ground chalk, to be used as above described.

The third part of this invention consists in saturating the fabrics to be dyed or printed with a soapy or saponaceous solution, which must be dried in the goods previous to a mordant being applied. The solution is prepared by adding one pound of soap to twelve gallons of water, and is used either hot or cold: this is the strength at which the solution is to be employed when the piece of goods is conducted into the solution in a dry state; but when it is introduced wet from the bleaching process, the solution must be a little stronger. The patentee has found the following solution to answer very well; although he does not consider it quite equal to the preceding one:—He takes the soap liquor, in which the pieces of goods have been soaped, from the soap liquor beck, and adds as much resin as it will dissolve; and then he passes the fabric through it, as before mentioned: when the fabric has been dried, it will be ready for the usual mordants. He has also used with advantage a solution made by dissolving one pound of borax in six gallons of water, and then adding as much resin as it will dissolve.

The last part of the invention consists in facilitating the extraction of the coloring matter from dye-woods or other dye-stuffs by the employment of a solution of soap, or a solution of borax, or a solution of both combined, of such strength as the nature of the dye-woods or dye-stuffs may require.—[*Inrolled December,* 1851.]

To JOHN MERCER, *of Oakenshaw, Clayton-le-Moors, chemist, and* JOHN GREENWOOD, *of Irwell Springs, Bacup, Turkey-red dyer, both in the county of Lancaster, for certain improvements in preparing cotton and other fabrics for dyeing and printing.*—[Sealed 15th March, 1852.]

THIS invention relates to the preparation of cotton and other fabrics with oil, which is called, in the art of dyeing Turkey-red, the "oiling process;" and it consists in causing the fabrics to be wet with water or a watery solution when passed through or impregnated with oil.

The patentees take cotton or other fabric, in the ordinary partially bleached state, and wet it with water or a watery solution of carbonate of potash or soda, containing four or five ounces thereof to the gallon (preferring to use the "padding machine" for this purpose); and in this wet state they pass it through olive oil at a heat below that of boiling water—from 140° to 160° Fahr.

The oil is contained in a cistern, having a series of rollers in it, and at one end a pair of padding bowls. The wet fabric is conducted through the oil and under and over the rollers, and is then passed between the padding bowls. The fabric is then taken to the stove and dried by exposure to a temperature of from 160° to 180° Fahr.; and afterwards it is treated with dilute solutions of carbonated alkalies, and stoved in the usual manner. Instead of the oil being employed at a temperature below that of boiling water, it may be used above the heat of boiling water; and then its temperature is preferred to be from 240° to 300°: in other respects, the process is the same as before described. In this case, the heat of the oil changes the water in the fabric, while passing through it, into steam, which ascends through the oil and escapes.

The patentees state that they prefer to use olive oil in which carbonate of potash or soda has been dissolved, in the proportion of six or eight ounces to the gallon, similar to what is stated in the second part of the specification of letters patent which were granted to the present patentees June 22, 1846. They do not confine themselves to any particular mode of wetting the cloth or other fabric; nor to the use of any particular alkaline salt that the oil may hold in solution; nor to any particular kind of oil; nor to the temperature of the oil; nor to the apparatus or way of applying the oil. But what they claim is, the causing the cloth or fabric to be wet with water or watery solution when passed through or impregnated with oil.—[*Inrolled September*, 1852.]

To Thomas Henry Fromings, *of the Firm of Lomas, Fromings, and Co., of Sheffield, in the county of York, manufacturers, for improvements in forge-hammers.*—[Sealed 16th October, 1851.]

This invention consists in so constructing forge-hammers, that they may be employed for all kinds of forging with greater facility and economy than the power-driven hammers hitherto in use, and will be more suitable for forging many small articles (such as edge-tools, files, knives, &c.), which are now forged by manual power, applied directly to the shaft of the hammer.

In Plate X., fig. 1, is a front view and fig. 2, a side elevation of an improved forge-hammer. *a*, is the base-plate, mounted upon large ashlar stones, under which oak-beams are laid, and the whole secured together by holding-down bolts. *b, b*, are standards, bolted at the bottom to the plate *a*, and at the top to a cross-rail *c*. *d*, is the hammer-block, which is fixed upon a block of wood, and supports the anvil *e*. *f*, is the hammer, affixed to the hammer-head *g*, which is keyed to a guide-rod *h*, the upper end whereof works through a brass bush in the rail *c*. To the rod *h*, is secured a cross-head *i*, which is capable of working freely up and down in slots in the standards *b*, and projects at each end a short distance beyond the standards, so as to stand in the path travelled by the cams *j, j*, on the shaft *k*: therefore, when the shaft *k*, revolves, the cams come against the ends of the cross-head *i*, and raise it, together with the hammer; and when, as the shaft continues to revolve, the cams pass from beneath the ends of the cross-head *i*, the hammer drops.

The cams are shewn with two rises or arms upon them; but they may be formed with a larger number, or only a single one, according to the speed at which the hammer is to be worked and the amount of power available for working the same. When the hammer is to be driven very fast, a helical spring is placed around the rod *h*, and attached to the rail *c*; which spring is compressed between the cross-head *i*, and the rail *c*, when the hammer is raised; and, on the cams passing from beneath the ends of the cross-head, the spring accelerates the descent of the hammer and increases the force of the blow. Springs of any other form may be substituted for the helical spring. The power for working the hammer may be applied to the shaft *k*, by any suitable mechanical contrivance, and may be derived from any prime mover, such as steam, water, or even manual labor.

The patentee claims, as his invention, the improved forge-hammer above described, in the general arrangement, combination, and adaptation of parts of which the same consists,—that is to say, in so far as regards the employment of cams, attached to a revolving shaft, to actuate the cross-head affixed to the guide-rod of the hammer; and also of springs to increase the force of the hammer, as before described.—[*Inrolled April,* 1852.]

To JAMES SLATER *and* JOHN NUTTALL SLATER, *of Dunscar, near Bolton-le-Moors, in the county of Lancaster, bleachers, for certain improvements in machinery or apparatus for the purpose of stretching and opening textile or woven fabrics.*—[Sealed 28th December, 1850.]

THIS invention consists in untwisting, stretching, and opening goods or woven fabrics in the process of bleaching or dyeing. The patentees remark, that in the old practice of bleaching the goods were removed from one process to another, piece by piece; but in the more recent practice the pieces of textile or woven fabric are stitched or fastened to each other, end to end, so as to form a considerable length of woven material, and in this state are passed, by machinery, in a continuous band from one process of bleaching to another. By this plan the cost and labor of the former practice of moving the goods in masses are greatly reduced; but, during its course, the band or continuous length of woven textile fabric is constantly becoming twisted in one direction or the other, during the bleaching or dyeing process; and considerable labor and expense are incurred in stretching or untwisting and opening such continuous band, so that it may be plaited down in a proper form when finished, or placed, with a smooth surface, on rollers, preparatory to the mangling or dyeing process.

In Plate X., fig. 1, represents a side elevation of one arrangement of apparatus, constructed according to this invention, applicable to the stretching and opening of ordinary calicoes in the bleaching process; and fig. 2, is a transverse section thereof. A, A, are two spur-wheels, one of which is driven by any adequate first mover; and as the two wheels gear into each other, they necessarily revolve in opposite directions. On the respective shafts of the wheels A, A, are placed the pulleys *a, a,* which partake of their rotation; and intermediate between the pulleys *a, a,* is suspended a small pulley Z, of peculiar construction. This pulley Z, is supported on its journals by two vibrating levers B, B, and may be

brought in contact with either of the larger pulleys *a, a,* by the operator, who governs its position by moving the lever *b,* at the opposite end of the shaft C, from which the levers B, B, are suspended. By this arrangement, supposing the operator to keep the levers B, B, perpendicular, the pulley Z, will remain at rest; but, if vibrated and brought into contact with either of the revolving pulleys *a, a,* it will, by friction of contact, be caused to revolve in one direction or the other. Fig. 3, is a longitudinal section and fig. 4, an end view of the pulley Z, upon an enlarged scale. It is constructed of brass, with the exception of an iron rim or hoop *y,* which comes in contact with one of the pulleys *a, a,* when vibrated by the operator. The pulley Z, is hollow, and fitted in the interior with four small levers or finger-pieces D, which move freely on their respective fulcrums *d;* and around the ends of these four levers is placed a ring of India-rubber *e,* which has a constant tendency to force them together at the centre of rotation, as indicated by dotted lines in fig. 3. The twisted band or continuous length of woven or textile fabric, marked *o,* is passed through the centre of the pulley Z, and thence forward between a pair of rods or flat bars at E, from which it proceeds to the camory or drawing-rollers at F. The operator, standing at the lever *b,* looks on the band of woven fabric as it is drawn forward from the centre of the pulley Z, and, according to the direction of the twist there may be in such band, vibrates the pulley Z, into contact with one or other of the pulleys *a, a,* which instantly revolves the pulley Z; and the band of textile or woven fabric is untwisted or stretched by the pressure of the levers D, so as to take out any twist which may be in the goods, in one direction or the other. The continuous band of woven or textile fabric then proceeds forward to the flat surfaces or bars at E, where it is spread out into its original form by the constant elevation and depression of the bars E, which receive motion from a crank on the revolving shaft H. From between the bars E, the band of textile or woven fabric passes over the wince or revolving ribbed wheel G, which, periodically striking and shaking the fabric as it passes over the ribs, delivers it in a smooth and flattened state to the camory or drawing-rollers at F, where the operation is completed;—the goods being afterwards plaited or folded down by the vibrating lever X, in the ordinary way. By this arrangement, the operator, who stands at the lever *b,* has the command of the rotation of the pulley Z; and also, by a series of levers (which the patentees have not thought it necessary to shew), the command of the

rotation of the camory or drawing-rollers at F, as well as those at M; so that he can, at any moment, arrest the progress of the operation.

In the above apparatus for bleaching purposes (which is equally adapted for dyeing or other processes where the goods are passed in a continuous band, as described) the two most important points of the arrangement are the untwisting or stretching represented at Z, and the vibrating or opening, as described at E. The mechanical arrangements, already described, for effecting the two operations of opening and stretching, are found to answer well; but it will be obvious, that such mechanical arrangements may be variously modified and varied, without departing from the essential character of the invention. In illustration of this, the patentees describe a different arrangement for effecting the untwisting or stretching movement, and likewise a different arrangement for effecting the opening movement.

Fig. 5, represents a front elevation, and fig. 6, a side elevation of another stretching or untwisting apparatus, for the same purpose as that already described at Z, (figs. 1, and 2,); —the same letters of reference indicating the same parts. This apparatus is placed in a perpendicular position; and the patentees remark, that the apparatus, already described, may be placed horizontal, perpendicular, or at any angle, as convenience may require. In this perpendicular position, the weight of the continuous band of goods falling into the cone Z, causes them to partake of its rotation. The direction of rotation of the cone Z, is governed by the traverse of the lever *b*, (see fig. 6,), which brings it into contact with one or other of the driving pulleys *a*, *a*; and the stretching or taking out of the twist is thereby effected, as required.

Fig. 7, represents a side view, and fig. 8, a front view of another modification of apparatus for vibrating or opening the continuous band of goods. In this arrangement, motion is imparted by a strap to the pulley *i*, placed on a shaft carrying the parallel ribs or shafts K, which are thereby periodically revolved. The spur-wheels *m*, *m*, gear into each other, and communicate a reverse rotation to a shaft, also carrying ribs R. The band of goods is passed between the rods K, and R, as indicated at *o*; so that the goods are necessarily vibrated as the rods K, and R, alternately pass them in opposite directions. These and various other arrangements may be adopted for the same purpose; although the arrangement first described has been found fully to answer the purpose required.

The patentees claim, Firstly,—the stretching or untwisting

of textile or woven fabrics, as above described, by machinery and apparatus applied for that purpose; and, Secondly,—the opening of such goods by a vibratory motion, as above described.—[*Inrolled June*, 1851.]

To PETER CLAUSSEN, *of Gresham-street, in the City of London, Gent., for improvements in the manufacture of saline and metallic compounds.*—[Sealed 3rd February, 1852.]

THE first part of this invention relates to the manufacture of certain saline compounds, such as nitrate of potash, and consists in treating ammonia, and certain ammoniacal compounds evolving ammonia, in such manner that the volatile alkali may suffer decomposition and oxidation, so that certain nitracids, and especially nitric acid, may be formed;—lime, potash, soda, or other suitable base being presented to the nascent nitracid, in order that nitrate of lime, potash, or soda may be produced. To assist the oxidation of the ammonia, the patentee employs an apparatus containing pumice-stone, charcoal, coke, platinum foil, spongy platinum, or other substances which present an extended surface, possessing the property of absorbing large quantities of oxygen. The ammoniacal liquid is allowed to pass over the surface of the spongy platinum or other substance; and it is then, in its oxidated state, brought into contact with a suitable base, so as to form a nitrate of the same. The patentee states, that when using an ammoniacal salt (such as the sulphate of ammonia), he first presents to the salt some suitable body (such as lime) with which the acid will combine, setting the ammonia free: the part of the apparatus in which this change takes place must be closed, to prevent the escape of the liberated ammonia into the air. The ammonia, being absorbed by water, is allowed to drop on to the surface of the spongy platinum or other oxidating substance, and then into a solution of the base of the future nitrate. The above process may be employed in the nitrification of the ammonia obtained in the manufacture of gas from coal.

The second part of the invention relates to the manufacture of soda salts, and consists in the conversion of sulphate of soda, whether made directly or produced as a residuum, into caustic soda (hydrate of soda) and carbonate of soda. Thus, to a solution of sulphate of soda is added a suitable proportion of some substance, which, having a greater affinity for sulphuric acid than soda, will decompose that salt and set

the soda free. If, for example, the hydrate of lime, baryta, or strontia be used, sulphate of lime, baryta, or strontia will be formed, and hydrate of soda be left in solution. By long exposure to the atmosphere, carbonic acid will be absorbed, and the hydrate of soda will thereby be converted into carbonate of soda. The decomposition of the sulphate of soda is facilitated by the application of heat.

It is also proposed by the patentee to manufacture hydrate of soda and carbonate of soda direct from common salt, by decomposing that substance by certain organic acids (which are afterwards decomposed by heat); or by gaseous acids; or by hydrates, oxides, peroxides, and certain metallic bases; or by certain carbonates,—carbonate of ammonia excepted.

The patentee claims, First,—the method of oxidation and combination of ammonia with alkaline and earthy bases, for the purpose of forming nitrates. Secondly,—the formation of caustic soda and carbonate of soda by the double or simple decomposition of sulphate of soda or of chloride of sodium.—[*Inrolled August*, 1852.]

To THOMAS SKINNER, *of Sheffield, for improvements in producing ornamental surfaces on metal and other materials.*—[Sealed 14th August, 1851.]

THIS invention relates, firstly, to certain means of producing ornamental surfaces on metal; and, secondly, to certain means of ornamenting ivory and bone.

The first part of the invention consists, chiefly, in the use of the combined processes of transferring impressions from engraved or printed surfaces on to metal, and electro-plating or electro-gilding them after biting out the metal, so as to leave the design either sunken or in relief. The metal surface to he ornamented is first well cleansed: which may be effected by rubbing with wash-leather and powdered lime. An impression taken, by preference, on tissue paper, is placed face downwards, on the clean metal surface, and rubbed on the back with flannel or other suitable material, so as to transfer it to the metal surface; and when this has been done, the paper is washed or sponged off: if stronger paper is used for taking the impressions, the back of the paper is smeared over witb black lead, and rubbed with a smooth ivory or other hard surface; after which the paper may be stripped off from the metal. A ground or coating of dissolved gum (by preference, gum guaiacum, dissolved in spirits of wine) is

laid with a camel's-hair brush over the metal; and when the ground is dry, the impression is washed off by means of a little cotton or other suitable material: this may readily be done, as the gum does not fix itself to the impression. Those parts of the metal which were previously covered by the impression being thus left clean, are now bitten out with acid, in the manner practised by engravers; and after this the ground is removed.

Or, in place of proceeding in the above manner, the process may be reversed, and the acid caused to act upon every part of the metallic surface which is not covered by the impression. For this purpose, when the impression has been obtained on the metal, it is sprinkled over with powdered resin, asphaltum, or other suitable matter, which will adhere to the impression, but not to the clean metal; and after the superfluous powder has been removed, the resinous matter is caused to melt and adhere to the impression, by warming the metal. When the impression has been thus protected by a coating that will resist the action of the acid, the other parts of the surface are bitten out; and then the impression is removed by a suitable solvent.

The metal surfaces which have been treated according to either of the above methods, are to be prepared for electro-plating or electro-gilding by removing the effect of the acid: this is done by the use of hot water, in which a small quantity of potash or soda has been dissolved, and by scratching with a wire-brush. The metal surfaces are afterwards electro-plated or electro-gilded by any of the known processes.

Although this part of the invention consists chiefly in ornamenting metallic surfaces by the combined processes above described, the patentee likewise proposes to produce ornamental surfaces on Britannia metal and German silver, by simply transferring impressions and biting them out with acid, without subsequently electro-plating or electro-gilding the same.

The following are the means of ornamenting surfaces of ivory and bone, which form the second head of this invention:—An impression is first transferred on to ivory and bone in the manner above described; then the surface is covered with a coating of gum, and the impression removed with turpentine, as before; after which, the pores of the ivory or bone are opened by the application of diluted acid, and, by the aid of ink or dye, the parts from which the impression has been removed are dyed;—or the dyeing may be effected without the application of acid. Or the parts may be bitten out with

acid and the work filled in with sealing-wax, dissolved in spirits of wine or other suitable solvent: gum-lac or other substances may be used instead of sealing-wax; and the work may be buffed, in order to give it a high polish.

The patentee states, that he does not confine himself to the above details. He claims, First,—the means, above described, of producing ornamental surfaces on metals. Secondly,—the means, above described, of producing ornamental surfaces on ivory and bone.—[*Inrolled February*, 1852.]

Scientific Notices.

RULES AND INSTRUCTIONS ISSUED UNDER THE NEW PATENT LAW AMENDMENT ACT.

SINCE the date of our last publication further rules have been issued for determining the practice to be followed under the New Patent Law; but, judging from the proceedings of the Commissioners, we should say that the labor which has been put upon them, is much akin to that which the advertising tailor sought, who guaranteed to fit any customer on receipt of the measurement of his thumb-nail. That the effect of the law was wholly unknown to its framers, we are perfectly satisfied, from what has already transpired; and that the Commissioners, while called upon to interpret the law, and put it in practice, should—what with having to give definiteness to vagueness, and congruity to inconsistency—find themselves somewhat perplexed, is not to be wondered at. Thus the conviction of the necessity to enrol a complete specification in Scotland and Ireland, as well as in England, having been once established in the minds of the Commissioners, and no provision appearing in the Act for saddling the patentee with the cost of more than one specification, and a duplicate set of drawings, they naturally concluded that their Office was liable for the extra expenses, and thereupon followed the order on which we commented in our last number. Since then, however, as we predicted, this order has been withdrawn; and, at present, we are without any instructions upon the subject. In like manner, orders, relating to proceedings which come under the immediate cognizance of the Attorney and Solicitor-General, have been issued and withdrawn,—the same having been replaced by another set, much less general and explicit, and therefore much better suited to the state of our limited expe-

riences. These changes, to say the least of them, indicate a strong desire on the part of the Commissioners to make the new law as efficient as it is possible; but they shew also the difficulty of the subject in hand; and present very evident symptoms of the disadvantages that accrue from reckless legislation,—even when, as in the present instance, great latitude is allowed to the authorities to whom the working out of the Act is entrusted. There is some comfort derivable from the fact, that a patent, when once obtained, will be as secure a property as heretofore, if the same amount of caution is exercised by the inventor in keeping his improvements secret until his patent is sealed; but it is impossible to foretel what difficulties he may encounter if he relies implicitly upon the advantages promised by the Act on the grant of a certificate of provisional protection, and is thereby induced to delay the completion of his patent until the latest period allowed by law. Our surmises of hidden difficulties ahead, awaiting the incautious inventor, may, and we sincerely trust will, prove to be groundless; we cannot, however, dismiss our fears, until we see the *ultimatum* of the Commissioners respecting the practice to be adopted in every stage of the patent's progress—and, more especially, their views as to the ante-dating of these grants. The uncertainties with which the new law is encompassed appear in no degree to have prevented inventors from availing themselves of its supposed benefits; and, in consequence, no less than 550 applications have been entered since the 1st of October. That a large proportion of these will stop at the stage of provisional protection, there is little doubt; but the number of notices to proceed, already advertised by the Commissioners (amounting to no less than 125), affords sufficient ground for concluding that their will be a very large increase in the number of patents annually granted. The following are the new orders issued by the Commissioners:—

Second Set of Rules and Regulations under the Act 15 *&* 16 *Vict.*, *c.* 83, *for the passing of Letters Patent for Inventions.*

By the Right Honorable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain; the Right Honorable Sir John Romilly, Master of the Rolls; Sir Frederic Thesiger, Her Majesty's Attorney-General; and Sir Fitzroy Kelly, Her Majesty's Solicitor-General; being four of the Commissioners of Patents for Inventions under the said Act.

The office of the Director of Chancery in Scotland, being the office appointed by the Act for the recording of transcripts of

letters patent, shall be the office of the Commissioners in Edinburgh for the filing of copies of specifications, disclaimers, memoranda of alterations, provisional specifications, and certified duplicates of the register of proprietors.

All such transcripts, copies, and certified duplicates, shall be bound in books, and properly indexed; and shall be open to the inspection of the public, at the said office, every day, from ten to three o'clock.

The charge for office copies of such transcripts, copies, and certified duplicates, recorded and filed in the said office, shall be at the rate of twopence for every ninety words.

The Enrolment Office of the Court of Chancery in Dublin, being the office appointed by the Act for the enrolment of transcripts of letters patent, shall be the office of the Commissioners in Dublin for the filing of copies of specifications, disclaimers, memoranda of alterations, provisional specifications, and certified duplicates of the register of proprietors.

All such transcripts, copies, and certified duplicates, shall be bound in books, and properly indexed; and shall be open to the inspection of the public, at the said Enrolment Office, every day, Christmas Day and Good Friday excepted, from ten to three o'clock.

The charge for office copies of such transcripts, copies, and certified duplicates, enrolled and filed as aforesaid, shall be at the rate of twopence for every ninety words.

No warrant is to be granted for the sealing of any letters patent which contains two or more distinct substantive inventions.

A provision is to be inserted in all letters patent in respect whereof a provisional and not a complete specification shall be left on the application for the same, requiring the specification to be filed within six months from the date of the application.

No amendment or alteration, at the instance of the applicant, will be allowed in a provisional specification after the same has been recorded, except for the correction of clerical errors, or of omissions made *per incuriam*.

The provisional specification must state distinctly and intelligibly the whole nature of the invention, so that the law officer may be apprized of the improvement, and of the means by which it is to be carried into effect.

The fee to be paid for every duplicate of such letters patent as may have been destroyed or lost shall be One Pound.

Where the applicant desires his letters patent to extend to any of the Colonies, he must specify, in his petition for the same, the particular Colony or Colonies to which he desires it to extend; and when the applicant shall give notice of his intention to proceed with his application for letters patent, the law officer, to whom such application is referred, shall hear him or his agent

upon such extension; and the said law officer shall make his report to the Lord Chancellor thereon. And no warrant for letters patent containing such extension shall be made unless the Lord Chancellor shall allow the same.

(Signed) St. Leonards, C.
John Romilly, M. R.
Fred. Thesiger, A. G.
Fitzroy Kelly, S. G.

Dated the 15*th Oct.*, 1852.

PATENT LAW AMENDMENT ACT, 1852.

15 *&* 16 *Vict*, *c.* 83.

Ordered by the Right Honorable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain.

Every application to the Lord Chancellor against or in relation to the sealing of letters patent shall be by notice; and such notice shall be left at the Commissioners' Office, and shall contain particulars in writing of the objections to the sealing of such letters patent.

(Signed) St. Leonards, C.

Dated the 15*th Oct.*, 1852.

INSTITUTION OF MECHANICAL ENGINEERS, BIRMINGHAM.

(*Continued from page* 308.)

The following paper, by Mr. George H. Bovill, of London, was read,—"*On a new improved screw propeller.*"

The screw propellers generally used are formed of two blades, continued down to the shaft,—the boss being reduced to the smallest size consistent with strength. The Government, by their experiments with the "Rattler," "Minx," &c., appear to have determined thus far the general outline of principles for constructing the screw; but the correct pitch, diameter, and length, as well as the number of blades necessary for obtaining the best results, are still matters upon which scarcely two engineers agree; and the equally important point, the correct speed to drive the screws, is a still greater matter of doubt. On reference to Mr. Murray's valuable work on Steam Vessels and the Screw, it will be found, on comparing the various vessels in Her Majesty's Navy, that the most singular circumstances occur in the comparative proportions of screws, as well as the speeds expected from the engines, compared with the actual revolutions obtained on trial.

In the year 1849, Mr. Griffiths explained to the writer his then crude notions for removing the defects of the ordinary screw. The idea was so original, and appeared to him so correct, that he at once instituted a series of experiments, which proved the great importance of the invention, and induced him to make further experiments, which he believes will have removed the uncertainty and objections that surround the ordinary screw; thus rendering its future application and results as certain as the paddle-wheel.

The construction of the new propeller is shewn in Plate IX., at figs. 1, 2, and 3. Fig. 1, is an end view; fig. 2, is a longitudinal section; and fig. 3, is a plan view. Each of the propeller-blades *a*, is separate, and terminates in a strong spindle *b*, which turns in a socket in the centre boss, fixed on the propeller-shaft *c*. A cross-arm *d*, is fixed in the spindle *b*, to turn round the blade and hold it in any required position. The arm *d*, works in a slot in the socket; and the end of the arm is connected by a pin to the block *e*, which slides in an oblique groove (shewn in the plan view, fig. 3). This groove is formed in a ring *f*, which slides upon a feather, so as to revolve with the main shaft; and it is moved by the bell-crank lever *g*, centred in the rudder-post of the vessel, and worked by a screw and handle upon deck, on the top of the rod *h*: by moving which lever, the pitch of the propeller-blades is easily altered to any required degree, and maintained in the same position,—the strain being very small, as the blades are nearly balanced, like a throttle-valve, and have only a slight surplus of tendency to increase the pitch, or become more in line with the shaft. The whole of the apparatus is contained within a spherical casing, one-third the diameter of the propeller, which effectually protects it from injury.

It will be seen that the form of this propeller is opposed to all the received notions of a correct screw propeller. The first leading feature is, that instead of continuing the blades down to the shaft, and keeping the centre boss as small as possible, one-third of the entire diameter is filled up as a sphere. In the experiments which Mr. Griffiths and the writer made, it was ascertained that the centre part of the blades of the ordinary screws absorbed 20 per cent. of the power, without having any propelling effect, in consequence of that part of the blades (particularly in coarse pitched screws) being nearly in a line with the shaft,—the effect being, when working, to hurl the water off by its flapping and centrifugal action at right angles to the shaft, and seriously disturb the more solid water upon which the more effective portion of the screw should act. The great vibration at the stern of all screw vessels arises from this flapping action of the flatter portion of the blades, in their downward course, striking the denser water below them; which, affording a greater resistance than the water above the blade in its upward course, produces this evil vibration, at an enormous sacrifice of power.

The effect of this destructive action can be appreciated by the fact, that screw vessels, if trimmed, say, two inches by the stern, when under canvas or at anchor, will suddenly be two inches down by the head the moment the engines are set to work: in point of fact, a large amount of engine-power is exerted in lifting the stern of the ship out of the water by the action of the flat part of the screw-blades, as described.

The ball shewn in the drawing is made to cover this destructive portion of the screw-blades, or rather is substituted for the central third portion of the screw. It will be evident that the power required to revolve this in the water, at a great velocity, is insignificant, compared with driving two or three comparatively flat blades of the same diameter, which may be fairly compared to the centre of a centrifugal pump. That there can be no tendency to vibrate the stern of the vessel is obvious; nor does the trim of the vessel alter, in the least degree, when under the action of the new propeller. Moreover, from the water not being violently agitated by the centrifugal action, the effective parts of the propeller's blades are screwing in stiller and more solid water,—producing a better result, and with a considerably less amount of slip. The water leaves the propeller in a direct line with the vessel, and without the commotion resulting from the ordinary screw. The strength of the screw is much increased by this form, which also affords great facility for replacing the blades in case of accident, to which screw vessels in channel and river navigation are peculiarly liable.

The second important feature is the form of the blades, which, instead of being larger at the extremities, are precisely the reverse. The best form the writer has found to be that shewn at fig. 1. The breadth of the blades is the full diameter of the sphere at the root, tapering to $\frac{2}{3}$ of this size at the periphery, at which part they are about $\frac{1}{3}$ only of the size of the ordinary screw-blade; and, with these proportions, so complete is the hold this propeller has upon the water, that it has been requisite, in practice, even to reduce the diameter considerably below the ordinary screw.

The water which follows the wake of the ship, and what the sailors call the "dead water," may be compared to the eddies below the piers of a bridge through which a rapid tide runs, and where, as every one knows, the water is dead or in a state of rest, the more so at the very centre of the pier. In a precisely similar condition is the dead water of a vessel,—the water being most solid towards the centre, and gradually becoming less so until mixed in the current running beyond the width of the ship. It must be obvious that the nearer the work can be applied to the screw-shaft the better mechanical result will be obtained; and the arrangement of the blades of the new propeller has been so contrived that their broad part is made at the ball, so that advantage is taken of the central dead water, just described, to obtain

the utmost duty from the propeller-blade at its root, or as near the screw-shaft as the central ball will admit. The blades are reduced towards the periphery to meet the difference of velocity at which they travel through the water. So effective is the hold of these blades upon the water, from the causes described, that the speed of the propellers can be reduced, with the greatest advantage, one-third below the velocity found necessary for the ordinary screw: a fact which every engineer will admit to be of great value, seeing the many mechanical difficulties which present themselves in obtaining the speed hitherto considered necessary.

The screw has hitherto almost entirely been applied as auxiliary power; and, where large power has been employed, it has never yet been made to equal the speed of the paddle-wheel. The imperfections of the screw appear hitherto to have placed a limit on the speed it was possible to obtain. In those vessels where a large amount of engine-power was applied, no adequate increase of speed was obtained; and in the case of the "Rifleman" and others, which were altered, and the engine-power absolutely reduced one-half, as good a result was obtained after the alteration as with the larger power;—shewing that, beyond a given power, the water is screwed through the screw, instead of the vessel being screwed through the water. This action takes place in all screw vessels, to a most serious degree, when going head to wind, or in towing, when the engines make their full number of revolutions, but have little effect in propelling the ship. The perfect hold that the new propeller has also, under such circumstances, upon the water, bids fair entirely to remove these difficulties, and will tend greatly to increase the value of the screw as a propeller.

The new propeller was applied to a tug-boat, the "Lady Emily," of 12 horse-power,—diameter of screw, 3 feet 8 inches,—on the Kennet and Avon Canal, under the direction of Captain Morrice, R.N., the manager; and she went from Bath to Bristol with one barge laden with 60 tons (deducting stoppages going through locks) in 2¾ hours,—the distance being 18 miles. As other barges were added, the speed was reduced; and the engines were pulled up in exact proportion to the reduction of speed. The revolutions of the propeller, without any barge in tow, were 210 per minute; with a 60 tons loaded barge, they were reduced to 180; with two barges, to 160 revolutions per minute.

The question of the pitch of the screw appears hitherto to have baffled all those who have experimented upon it;—the ordinary theory being, that an increase of the screw's pitch should either pull up the engines, or increase the speed of the vessel in proportion to such increase of pitch; but all the practice hitherto has proved this not to be the case: consequently, the screws have been made without any power of altering the pitch to meet the variations of winds and currents, to which all sea-going vessels are subject; and they have been thus deprived of what would

appear to be the most valuable feature of the screw, viz., its power of adapting its pitch to meet every contingency. It has been found by the experiments that, with the new propeller, the engineer can control the speed of his engines at pleasure, by increasing or diminishing the pitch of the blades; so that, in a fair wind, the full power of the engines may be exerted in effectually propelling the vessel, instead of consuming fuel in driving round the engines (with a fine pitched screw) to no purpose; and again, in going head to wind, by diminishing the pitch, the engines can be made to give out their utmost duty with a certainty of effectually propelling the vessel. The large central ball affords the opportunity of constructing a most simple and effective arrangement for altering the pitch of the blades, and feathering them parallel to the shaft when not required for propelling. The captain or engineer of the vessel can alter the pitch at pleasure, without even stopping the engines, the speed of which is, by means of this apparatus, as completely under control as with a throttle-valve.

A most serious disadvantage hitherto of the screw as a propeller, compared to the paddle-wheel, has been the great difficulty of going astern; and many serious accidents have happened to screw vessels, in crowded navigations, from its being out of the power of the captains, when in difficulty, to go quickly astern:—so soon as stern-way is obtained, screw vessels will not steer, and become unmanageable. During the experiments in the "Ranger" with the new propeller, the vessel was frequently stopped when at full speed, the engines reversed, and the ship brought quickly astern, nearly as quick as a paddle vessel; and a run was made above a mile astern, full speed, between Woolwich and Erith, steering among the various craft as easily as when going ahead. This fact gives further convincing proof of the complete power which this propeller gives the captain over his vessel. The power of going astern will be of enormous value to vessels of war in manœuvring in an engagement, which they do not now possess.

It will be clear, from the accompanying table of trials made upon the "Eagle," that as the pitch was increased, so was the engine brought up in her speed. The comparative slip between the new screw and the old one, at same pitch, 7 ft. 6 in., is 272 yards per mile, or 13 per cent. with the former, against 665 yards, or 27 per cent., with the latter;—the gain, with the same pitch, being an increased speed of ¼-mile per hour, with 27 revolutions per min. less of the engines,—making 16 per cent. less consumption of power and coals. At the 9-ft. 6-in. pitch the increased speed is ⅝ of a mile per hour, with 35 revolutions per min. less of engine,—making a saving of 22 per cent. The table also contains trials of the "Ranger," 300 tons, in London, and the "Weaver," at Liverpool,—the whole of the experiments illustrating the foregoing arguments.

TABLE OF COMPARATIVE TRIALS OF GRIFFITH'S SCREW PROPELLER.

Trials of the	Description of Screw.	No. of Trial.	Screw Propeller. Diameter.	Screw Propeller. Pitch.	Screw Propeller. Extreme Angle.	Screw Propeller. Revolutions per minute.	Engine. Revolutions per minute.	Engine. Steam Pressure per in.	Engine. Vacuum pressure per inch.	Time of Running, the measured Nautical Mile.	Speed. Statute Miles per hour. Boat.	Speed. Statute Miles per hour. Screw.	Slip of Screw.	Gain or Saving in Power.	Gain or Saving in Speed.
			ft. in.	ft. in.	Degrees	No.	No.	lbs.	lbs.	min. sec.	Miles.	Miles.	per Ct.	per Ct.	per Ct.
"Eagle" at Bristol.	Old	1	4 10	7 6	26½	200	200	38	—	5 34	12·36	17·00	27½	—	—
	New	2	4 10	6 6	23½	195	195	35	—	4 59	13·80	14·40	4	12¾	11¾
	"	3	4 10	7 6	26½	173	173	37	—	5 23	12·79	14·74	13¼	16½	3½
	"	4	4 10	8 6	29½	171	171	34	—	5 25	12·70	16·51	23	16¾	2¾
	"	5	4 10	9 6	32¼	165	165	35	—	5 15	13·12	17·80	26¼	22¼	6
"Ranger" at Liverpool.	Old	6	7 0	8 10	17¾	159	60	12	13½	7 3	9·76	12·33	20¾	—	—
	New	7	5 10	10 0	28½	116	44	10	12¼	6 36	10·45	13·23	21	36	6¾
	"	8	6 2	6 8	19	148	54	12	12	5 8	13·45	} —	—	—	—
	"	9	6 2	6 8	19	132	50	—	—	11 14	6·14	} —	—	—	—
	"	10	6 2	6 8	19	137	52	12	12	8 11	9·60	10·42	6	—	—
"Weaver" at Long Reach.	Old	11	3 3	4 6	24	332	83	11	14	6 2	11·40	16·97	32	—	—
	New	12	3 3	4 6	24	260	65	11	14	5 37	12·38	13·29	8	27	7½

EXPLANATION OF TABLE.

Trials of the Eagle, at Bristol, June, 1851.

Single high-pressure engine, cylinder 26 inches diameter, 18 inches stroke, screw worked by direct action. Vessel and engine by Lunell and Co., Bristol.

No. 1 trial—Average of several pair of runs with common propeller.

Nos. 2 to 5—Average of four pair of runs with new propeller.

NOTE.—The new propeller was made 4 feet 2 inches in diameter; but the opening in the vessel having been increased during construction to 5 feet, the propeller was enlarged in diameter, by welding pieces on the points of the blades, which were thereby thrown out of their proportionate size.

Trials of the Ranger, at Long Reach, December, 1851.

Pair of condensing engines, cylinders 27 inches diameter, 24 inches stroke, screw worked by gear of 106 to 40. Vessel and engines by Miller and Ravenhill.

No. 6 trial—Single run with common propeller, with a 40 minutes ebb-tide, and wind in favor.

No. 7—Single run at top of tide, with new propeller at the coarsest pitch.

NOTE.—The Ranger being employed on a station from which it was impossible to spare her for the purposes of experiment, there was no opportunity of making a proper set of trials to compare her ordinary screw with the new propeller; but her speed was taken at the measured mile, when going out with a cargo, with a 40 minutes ebb-tide and wind in her favor, as given in No. 6 trial.

No. 8—Run down with tide, with the new propeller.

No. 9—Run up against tide, with the new propeller, shewing a reduction of 4 revolutions per minute of the engine, with same pitch of screw.

No. 10—Average of Nos. 8 and 9 trials.

NOTE.—The pitch of the new propeller was subsequently reduced to 5 feet 2 inches when running against tide, which allowed the engines to get up to 70 revolutions per minute; by which a speed of 7·95 statute miles per hour against tide was obtained; and this added to the run down with tide No. 8, at 6 feet 8 inch pitch, gives an average speed of 10·69 miles per hour.

Trials of the Weaver, at Liverpool, June, 1852.

Pair of condensing engines, cylinders 22 inches diameter, 15 inches stroke, screw worked by gear of 4 to 1. Vessel by John Laird, Birkenhead; engines by Fawcett Preston and Co.

No. 11 trial—Average of pair of runs with common propeller, from Woodside-pier to Eastham-pier, $5\frac{3}{4}$ statute miles.

No. 12—Average of pair of runs, between the same places; with same state of tide as No. 11 trial in the preceding week, but wind strong and unfavorable, and a heavy sea.

Mr. Preston said he had witnessed the experiments made on the "Weaver," that were described in the paper, and could confirm the statement made as to the superiority of the new propeller in the diminution of slip, and the increase of speed of the vessel. He did not perceive any superiority in the amount of back-water produced; in going a-head, the vessel dipped a-stern with both propellers, and he did not perceive any difference; but it was a very flat vessel, and the bows rose so abruptly, that the head was forced up by the action of the water. The experiments were tried in the Mersey, above Liverpool, and the effect of tide was deducted by trying the experiment both ways. He doubted the practicability of keeping the apparatus for altering the pitch in working order, at sea, for any length of time.

Mr. Ramsbottom remarked, that if the pitch of the blades in an ordinary screw-propeller were the same throughout down to the centre boss, every part of the blade would have the same advancing motion in the water, and would screw correctly through it; and he could not understand how the centre portion of the blades could have the injurious flapping and centrifugal action mentioned in the paper, when the screw was advancing through the water; as such action could only take place if the arms were to revolve whilst the vessel was stationary.

Mr. Appold observed, that the ball would deflect the water, and throw a body of water on to the blades, giving them more water to act upon, and preventing the water from slipping away from the pressure of the blades, through the centre of the propeller, as in the ordinary form with an open centre. Supposing the propeller were working through a tube of the same diameter as the circumference of the arms, the centre ball would occupy one-third of the diameter of the tube, and reduce its effective diameter,—causing all the water to pass through the reduced area, and so bringing more water in contact with the arms in the same distance, and affording them a more solid abutment for their action.

Mr. B. Gibbons thought it was to be inferred from that argument, that it would be advantageous to enlarge the shaft to the size of the ball, so as to fill up the displacement of the ball, and that would avoid the resistance offered by the front of the ball being dragged through the water.

Mr. Appold suggested that a conical form might be preferable for the front of the ball, to deflect the water from the centre on to the arms. He had found that best in his centrifugal pump, in which there was a similar action, and the water entering at the centre had to be suddenly deflected at right angles into a radial direction. He had tried a pump with the centre bell-mouthed from the inside, with the object of affording a more free entrance for the water; but he found it gave less results than the form he had adopted, having a square edge inside the opening, and the centre coned from the spindle to the centre disc.

The following paper, by Mr. W. KELD WHYTEHEAD, of London, was then read:—"*On a new direct-acting steam-pump.*"

This steam-pump is of American invention, and has been used extensively there for feeding the boilers of marine engines. It is, however, well adapted for any purpose where a moderate quantity of water has to be raised, and where a rotary motion is not required. Fig. 4, in Plate IX., shews a longitudinal section of one that is fixed at the Great Northern Railway Station, at King's Cross, London, and used for supplying the station with water.

Its chief peculiarity is, that the stroke of the piston and of the pump-plunger is regulated without the use of a crank; so that the motion of the plunger is nearly uniform for the whole length of the stroke. Mr. Ericsson (of Messrs. Braithwaite's firm) made a fire-engine on this principle, some years back; and Mr. Penn formerly used the same arrangement for "donkey engines" for steam-boats; but both of these kinds of engine were deficient in smoothness of working,—a difficulty which has been overcome by Messrs. Worthington and Baker, the patentees of the present pump, by very simple and effectual means.

a, is the steam-piston, and *b*, the pump-plunger, both bolted to the same piston-rod. The plunger is double-acting, and works through metallic packing *c*. *d*, *d*, are the suction-valves, and *e*, *e*, the delivery-valves, consisting each of a ring of India-rubber, rising on a brass spindle, with a guard at the top, and falling on to a circnlar perforated plate. In the plunger are bored a few holes *h*, *h*, which have the effect of opening a communication between the two ends of the pump-barrel at each end of the stroke,—thus giving the water, as it were, a partial elasticity, allowing it to continue its forward motion, by flowing through the plunger during the moment that the plunger becomes stationary. This enables the plunger to commence its return stroke without any shock or concussion.

The slide-valve *i*, is moved by the tappet *k*, fixed on the piston-rod, and striking either of the nuts *l*, or *m*. Steam is admitted under the slide, as shewn; as the motion of the slide in one direction has to admit steam for the piston moving in the opposite direction. A "steam-buffer" is provided for the slide, to remove the concussion: *n*, is a piston, attached to the slide-rod, working in a cylinder, which has a small groove cut in the bottom of it; this cylinder is filled with steam from the slide-chest, through a small hole in the end; which steam is compressed by the piston *n*, at each stroke of the tappet *k*, and forms a buffer or spring of very perfect elasticity; and the compressed steam escapes immediately afterwards to the other side of the piston *n*, through the groove in the bottom side of the cylinder,—thus preventing any recoil of the valve. *o*, is an air-vessel on the delivery-pipe. The suction-pipe is carried up above the pump, to form a head, to make the flow of

water more uniform. In starting the pump, the hand-lever r, is put into gear with the nut l, as shewn by the dotted lines, and the valve is moved by hand for a few strokes, to let on the steam, until the engine is fairly started.

This pump has been at work for five months at King's Cross Station very satisfactorily,—the only repairs necessary having been about one day's work. It has to draw the water 14 feet perpendicular, and forces it 30 feet perpendicular. The usual speed is 40 to 50 double strokes per minute; but there is no difficulty in working it at double that speed if desired. The uniformity of the stream of water delivered is very remarkable, and seems to indicate that there is no loss of power, or, to speak more correctly, that there is never an excess of power to impart an undue velocity to the water. The small space occupied by the pump is an advantage of some importance when used for marine purposes.

Mr. Ramsbottom observed that he had seen the pump at work at the King's Cross Station, and it certainly worked well, with very little vibration, and delivered a steady uniform stream of water; but it was a defect that the economy of working expansively could not be obtained with a pump on that principle, as the full pressure of steam was required to complete the stroke. There was a simple contrivance in the shut-off valve of the delivery pipe, for changing the direction of the discharge: the valve was constructed with a double face, and fitted to shut the opening on either side, so as to pump into the tank, or into the fire-hose, by screwing the valve spindle in one direction or the other.

The Secretary said that Mr. Whytehead had expected to have given the results of a trial of the pump to ascertain the duty yielded by it, by measuring the quantity of water discharged, and taking indicator figures from the engine; but he had not yet been able to make the experiments.

Mr. Preston remarked, that a direct-acting steam pump had been constructed by Mr. Penn, for feeding marine boilers, but that he adopted a crank motion now for the purpose, finding the vibration and shock of the tappet motion too great for working the valve.

Mr. Ramsbottom observed that the steam buffer-spring upon the valve spindle in this pump appeared to be very effectual in taking off the shock, even when working at a considerable speed; and the equilibrium established between the two ends of the pump, by means of the holes through the plunger, caused the valves to close down upon their seats almost before the return stroke, and prepare the pump for the reversed action of the steam.

Mr. Appold inquired how long the India-rubber valves were found to last in pumps?

Mr. Preston said the India-rubber valves answered very well in the air-pumps of marine engines. They were always used for screw vessels, on account of the rapid action of the valves with short-stroke engines, for which metal valves were not applicable. The time they lasted varied very much with the circumstances. Vulcanized sheet India-rubber only should be used, and might last some months, perhaps a year; but the canvas valves, coated with India-rubber, soon decayed.

Mr. Clift remarked that a new mode had been brought out of preparing India-rubber with sulphuret of lead, instead of vulcanizing it with sulphur, which was said to be better and more durable; but he did not know the results of trial.

Mr. Appold doubted whether vulcanized India-rubber would stand a constant elastic action for a year, or even a less period. He had tried some India-rubber springs for window-shutters, and found they failed in three or four months: it was some years back; and he did not know whether the process of manufacture had been improved since.

Mr. B. Gibbons said he had found the elastic bands for papers, after lying by for two or three years, lost their elasticity, and became decayed.

Mr. Adams inquired whether the vulcanized India-rubber rings in railway carriage buffers and draw-springs were found to decay?

Mr. H. Wright said he had found the rings in buffers still remaining good after three or four years' work: the India-rubber was subjected to compression only, and was protected from wet. He had several hundred waggons under his charge working with India-rubber buffers and draw-springs, which were all doing very well. The only failure of the India-rubber rings that had been experienced amongst them was owing to the intermediate plates or washers between the rings, which were made at first of cast-iron, and too thin, becoming broken, and then cutting the India-rubber; but that had been remedied by using stronger wrought-iron washers.

Mr. Preston observed, that the India-rubber in pump valves was subjected to more severe wear, from the constant rapid bending, and the action of the water, than the mere compression in buffer springs. Some of the valves proved defective at first, in consequence of being cut transversely from a cylinder of India-rubber, which was manufactured by rolling up a long sheet: these valves split open in the roll and became defective, from the constant action upon them; but all he now used were cut out of a single flat sheet, and were found to stand very well.

Scientific Adjudication.

COURT OF ALDERMEN, GUILDHALL.

Before Mr. Alderman Moon.

BIDDELL *v.* ROGERS ET AL.

THIS was an information charging Messrs. Rogers and De Costa, commission agents, of Hutchinson Avenue, Petticoat-lane, with making or causing to be made, for the purposes of sale, a fraudulent imitation of an original design for an alarm door and window wedge, of which Mr. William Adolphus Biddell, brass-founder, of Great Sutton-street, Clerkenwell, was the registered proprietor.

Mr. Hawkins appeared for the prosecution, and Mr. Lewis for the defence.

The registered design consisted of a brass plate about three inches long and one broad, raised at one end by a pronged foot, and covered by a wedge-shaped cap; so that, by inserting a detonating ball between the plate and the cap, and placing the so-charged wedge at the bottom of a door or behind the sash-line of a window, any attempt to open either would be attended with an immediate explosion, loud enough to alarm a whole household, according to the number of detonators placed in the wedge; after which, the pronged foot, being forced, by the pressure caused by the explosion, into the floor or window-frame, would prevent the opening of either, and prove in itself an effectual protection from burglars.

Mr. Lewis took a preliminary objection, to the effect that the separate portions of the design in question were old, and therefore, according to the decision in the case of the "Queen *v.* Bessell," not entitled to protection.

Alderman Moon expressed a desire to discuss the matter progressively, to avoid confusion. He called Mr. Lewis's attention to the decision of Lord Campbell in the case of the "Queen *v.* Firmin," in which protection having been granted to the proprietor of a button ornamented with a scroll encircling some letters and the Royal Arms, it was sought to quash the conviction. In that case, Lord Campbell laid it down that a combination of two well-known designs might be so applied as to form a design entitled to protection by the statute; in which opinion Justices Coleridge and Patteson coincided. The worthy Alderman then said, with such excellent authority before him, he could only come to the same conclusion; and Mr. Lewis's objection was therefore overruled.

Mr. Hawkins then put in the registration certificate, and produced the article alleged to be an infringement of Mr. Biddell's design,—the only difference between the two articles consisting of a small well, with a groove leading down to it, and a barrier or raised edge behind it on the plate, to keep the ball from slip-

ping off on either side, or running down to the hinge connecting the plate with the cap; whereas, the surface of the plate in the registered design was traversed with grooves, so that as many as 30 detonating balls might be inserted as effectually as only one.

Evidence was then called to prove that the defendants had taken a copy of the registered design to a brass-finisher, of the name of Crouch, and instructed him to make such alterations in it as would entitle them to register it as their own design. By their directions Crouch purchased punches with the words "Rogers and Co.'s patent life protectors," with which to stamp the wedges he afterwards made from the pattern, containing his alterations; and he subsequently received orders from them for two gross, and money to buy the metal for their manufacture. He delivered in that quantity; and the defendants afterwards employed Mr. Bardell, a brass-founder of Artillery-lane, to cast some five or six gross; in the manufacture of which, a witness of the name of Hartley assisted, having been engaged for two years for that particular purpose. Mr. Biddell was examined; but his evidence merely tended to prove the legal points of the question.

Mr. Lewis contended that the alterations in the defendant's wedge were improvements that entitled it to protection, as, without them, the ball would be liable to escape from its place.

Alderman Moon said he had carefully considered that point; and if it had been intended that the wedge should be opened to its full extent every time it was charged, the barrier and well on the plate to hold the ball would be an improvement; but, as it was unnecessary to open the wedge so wide, the alterations were not available as an improvement.

Mr. Lewis said, as the worthy Alderman had stated that he "wished this court to be a court of equity as well as a court of law," he would mention, that an offer had been made by the defendants to stop selling the wedges, and give up all they had in stock, if these proceedings were stayed.

Mr. Hawkins said he understood the defendants had sold upwards of 30 gross, and if they would hand over the profits on that extensive sale, he would accept their offer.

Mr. Lewis said the profit had turned out a loss to his clients, as they had only sold a few shillings' worth of these wedges.

Alderman Moon said he was of opinion that the defendants had not only fraudulently imitated the design in question, but had also improperly used the word "patent" on their wedge, in order to evade the penalties of stamping an unregistered article as "registered." He therefore, as only one conviction was sought for, should fine Rogers—the partnership between him and De Costa not being proved—£5, and in addition award £10 for costs.

[This may or may not be a just decision; but, if the Alderman is right, he must lay it to his good fortune, and not to his knowledge of law; for the case which he cited had nothing whatever

to do with the question in hand. It was a combination to produce an ornamental device, and not to produce a new configuration, having reference to some purpose of utility, that Lord Campbell adjudicated upon. The Ornamental Designs Act must necessarily, to be of any avail, protect a new combination of parts; because ten thousand new designs might be made by the re-arrangement of the same materials; but a new combination of mechanical parts can only be secured under a patent,—the "Utility Designs Act," as it is termed, having reference solely to new forms, and not to mechanical contrivances.—*Ed. Lond. Jour.*]

LIST OF GRANTS OF PROVISIONAL PROTECTION UNDER THE NEW LAW.

Cases in which a full Specification has been deposited.

Henry Mortlock Ommanney, of the city of Chester, Esq., for the invention of an improvement in the manufacture of guns, cannon, and other ordnance.—October 1.

Henry Mortlock Ommanney, for an improvement in the manufacture of cylinders for hydraulic presses and other engines.—October 1.

Henry Mortlock Ommanney, for an improvement in the manufacture of wheels for railway carriages.—October 1.

Henry Mortlock Ommanney, for an improvement in the manufacture of stamp-heads for crushing ores.—October 1.

Edwin Bates, of Great Portland-street, London, county of Middlesex, Gent., for an invention for retarding and effectually stopping, at discretion, railway carriages, and also for carriages of all descriptions, for the more safely descending inclined planes, either in the streets or on turnpike-roads,—to be called "Bates's Break."—October 4.

Professor Andrew Crestadoro, of Genoa, in Italy, but now resident in Adelphi-place, Salford, in the county of Lancaster, for certain improvements in impulsoria, or machinery for applying animal power to railways, waterways, and common roads, and to other mechanical purposes; part of which improvements relate to railways and other carriages, to buffers, springs, brakes, and chains; and in the propelling vessels across liquid elements,—October 8.

Auguste Chesneau, of Welford-place, Leicester, in the county of Leicester, oil merchant, for the manufacture of an indestructible paving.—October 12.

William Chisholm, of Holloway, in the county of Middlesex, chemist, for improvements in the purification of gas, and the obtention of certain products during the process of such purification.—October 14.

George William Lenox, of Billiter-square, in the City of London, chain-cable manufacturer, and William Roberts, of Millwall, Poplar, foreman to Messrs. Brown, Lenox, and Co., of Billiter-square aforesaid, for improvements in machinery for raising and lowering cables and other chains.—October 18.

William Roberts, of Millwall, Poplar, foreman to Messrs. Brown, Lenox, and Co., of Billiter-square, for improvements in machinery for stopping and lowering cables and other chains.—October 18.

Cases in which a Provisional Specification has been deposited.

1. Robert Adams, of King William-street, in the City of London, for improvements in ball cartridges.
2. George Henry Brockbank, of Crawley-street, Oakley-square, in the county of Middlesex, piano-forte manufacturer, for improvements in upright piano-fortes.
3. Peter Spence, of Pendleton Alum Works, Manchester, in the county of Lancaster, for improvements in obtaining power by steam.
4. James Hodgson, of Liverpool, in the county of Lancaster, engineer and iron ship builder, for improvements in constructing iron ships and vessels.
5. Joshua Smith, of Sheffield, in the county of York, carrying on business along with his partner in trade, William Thorne, under the Firm of Thomas Turner and Co., as merchants and manufacturers, for improvements in table knives.
6. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of guns and pistols.
7. John Henry Gardner, of Poppin's-court, in the City of London, for improvements in toilet tables.
8. Richard Wright, of Greenwich, in the county of Kent, Gent., for improvements in constructing vessels.
9. George Green, of the Mile-End-road, in the county of Middlesex, for improvements in the manufacture of casks.
10. Freeman Roe, of the Strand, in the county of Middlesex, hydraulic engineer, for improvements in valves and cocks.
11. Thomas Wood Gray, of Warkworth-terrace, Commercial-road, Limehouse, in the county of Middlesex, for improvements in cocks and valves.
12. Thomas Wood Gray, of Warkworth-terrace, Commercial-road, Limehouse, in the county of Middlesex, for improvements in steam-engines.
13. Edward Lambert Hayward, of the Blackfriars-road, in the county of Surrey, for improvements in lock-spindles.
14. Thomas Christy, jun., of Gracechurch-street, in the City of London, for improvements in weaving hat-plush, and other piled fabrics.
15. Joseph Barker, of Kennington-lane, in the county of Surrey, for improvements in fastenings.

16. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of telescope and other tubes.
17. Charles Henry Newton, of Camden-road Villas, in the county of Middlesex, and George Leedham Fuller, of Peckham, in the county of Surrey, for improvements in protecting electric telegraph wires.
18. Thomas Dickason Rotch, of Furnival's Inn, in the county of Middlesex, Gent., for improvements in treating peat, and in manufacturing fuel and other products therefrom.
19. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in moulding articles, when India-rubber combined with other materials are employed.
20. Charles Frederick Bielefeld, of the Strand, in the county of Middlesex, for improvements in constructing portable houses and buildings.
21. George Duncan and Arthur Hutton, of Chelsea, in the county of Middlesex, for improvements in the manufacture of casks.
22. Henry Walker Wood, of Briton Ferry, near Neath, in the county of Glamorgan, for improvements in the construction of ships and other vessels.
23. Jean Baptiste Lavanchy, of Richmond-buildings, Soho, in the county of Middlesex, musical instrument maker, for improvements in wind musical instruments where metal tongues are employed.
24. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in the making covers for, and in binding, books and portfolios, and in making frames for pictures and glasses.
25. John Macintosh, of Berners-street, in the county of Middlesex, civil engineer, for improvements in regulating and governing the flow of fluids.
26. John Macintosh, of Berners-street, in the county of Middlesex, civil engineer, for improvements in evaporation.
27. John Macintosh, of Berners-street, in the county of Middlesex, for improvements in packing for steam-engines and other machinery.
28. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in coating metal and other substances with a material not hitherto used for such purposes.
29. John Daniel Ebingre, of Brussels, for improvements in the manufacture of animal charcoal.
30. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of trunks, cartouch and other boxes, knapsacks, pistol-holsters, dressing, writing, and other cases, and sword and other sheaths.
31. John Dunkin Lee, of Leadenhall-street, in the City of London, for improvements in covering railway trucks and other vehicles.

32. William Pym Flynn, of No. 18, Rutland-place, in the county of Cork, for improvements in paddle-wheels.
33. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of pails, tubs, baths, buckets, measures, drinking and other vessels, basins, pitchers, and jugs, by the application of a material not hitherto used in such manufactures.
34. Robert Beart, of Godmanchester, in the county of Huntingdon, for improvements in the manufacture of bricks and other articles through moulding orifices.
35. Thomas Huckvale, of Choice-hill, near Chipping Norton, in the county of Oxon, farmer, for improvements in instruments for administering medicine to horses and other animals.
36. James Hare, of Birmingham, in the county of Warwick, for improvements in expanding-tables and in music-stools.
37. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in covering and sheathing surfaces with a material not hitherto used for such purposes.
38. The Honorable William Erskine Cochrane, of Albany-street, Regent's-park, in the county of Middlesex, for improvements in unloading coals from ships or vessels.
39. Felix Abate, of George-street, Hampstead-road, and John Julius Cléro de Clerville, of Newman-street, both in the county of Middlesex, for improvements in preparing, ornamenting, and printing on surfaces of metal and other substances.
40. Frederick Richard Holl, of Weymouth-terrace, City-road, in the county of Middlesex, watch-maker, for improvements in watches and chronometers.
41. Joseph Barrans, of Queen's-road, in the county of Surrey, for improvements in steam-engine boilers.
42. Oswald Dodd Hedley, of Newcastle-upon-Tyne, for improvements in getting coal and other minerals.
43. Moses Poole, of Serle-street in the county of Middlesex, Gent., for improvements in harness, and in horse and carriage furniture.
44. James Hodgson, of Liverpool, in the county of Lancaster, engineer and iron ship-builder, for improvements in machinery for draining land.
45. Charles William Rowley Rickards, of the New-cut, Blackfriars-road, in the county of Surrey, for improvements in tongs for screwing pipes and tubes.
46. James Stewart, of Old St. Pancras-road, in the county of Middlesex, for improvements in the action of piano-fortes.
47. Stephen Perry, of Red Lion-square, in the county of Middlesex, for improvements in ink-stands or ink-holders.
48. Edmund Morewood and George Rogers, both of Enfield, in the county of Middlesex, for improvements in rolling metal.
49. Edmund Morewood and George Rogers, both of Enfield, in the county of Middlesex, for improvements in coating metals.

50. Walter Henry Tucker, of Fore-street, Tiverton, in the county of Devon, watch-maker, for certain improvements in locks (applicable to locks for all purposes), by which they can be made so as to combine increased and perfect security with simplicity and cheapness of construction.

51. Thomas Craddock, of the Ranelagh Works, Thames-bank, in the county of Middlesex, engineer, for certain improvements in the steam-engine and the steam-boiler.

52 Walter Mc Lellan, of Glasgow, in the county of Lanark, North Britain, iron merchant, for improvements in the manufacture of rivets and in working in metals.

53. Thomas Browne Dalziel, of Glasgow, in the county of Lanark, North Britain, manager, for improvements in the treatment or manufacture of textile fabrics or materials.

54. George Pearson Renshaw, of the Park, Nottingham, in the county of Nottingham, civil engineer, for improvements in turn-tables and traverse-tables, and in apparatus connected therewith.

55. George Mumby, of Harrington-street, Hampstead-road, in the county of Middlesex, mechanical draughtsman, for improvements in the manufacture of envelopes, and the machinery, apparatus, or means to be employed therein.

56. John Finlay, of Glasgow, in the county of Lanark, North Britain, ironmonger, for improvements in grates and fire-places, or apparatus for the generation of heat.

57. John Joseph Macdonnell, of the Temple-mead, in the City of Bristol, civil engineer, for certain improvements in the construction of railways.

58. William Willcocks Sleigh, of Queen-square, Bloomsbury, in the county of Middlesex, Doctor of Medicine and surgeon, for the invention for producing motive power, which he entitles "the counteracting re-action motive power engine."

59. Marcus Davis, of Lyon's Inn, Strand, in the City of Westminster, for certain improvements in the manufacture of carriages, carts, military and other waggons, and wheels for locomotive and other purposes.

60. William Wolfe Bonney and Robert Archbutt, of Hortulan-place, Chelsea, in the county of Middlesex, engineers, for improvements in machinery for raising a pile on linen, cotton, silk, or other fabrics.

61. John Baylis, of Owen's-row, in the county of Middlesex, crape manufacturer, for improvements in hat-bands and armlets.

62. John Sayers, of Prospect-place, Poplar, in the county of Middlesex, carpenter and ship joiner, for improved arrangements for maintaining a level surface or level surfaces upon or in connection with bodies subject to a rocking motion.

63. John Fordham Stanford, of Stangate-street, Dover, in the county of Kent, architect and civil engineer, for improved machinery and apparatus for manufacturing bricks, tiles, and

similar building materials, which is hereby denominated "the complete brickmaker."

64. Henry Richardson Fanshawe, of Arthur-street, Old Kent-road, in the county of Surrey, chemist and manufacturing agent, for certain improvements in shawls, scarfs, neckerchiefs, handkerchiefs, mantles, sails or sail-cloth, table-cloths and table-covers, napkins, and umbrella and parasol tops and covers; and in an improved loom for weaving, applicable especially to the said improvements, in respect to some of the said articles.

65. James Stocken, of Baldock, in the county of Hertford, pharmaceutical chemist, for an improved plaster spatula.

66. George Holmes, of Great Queen-street, Lincoln's Inn-fields, in the county of Middlesex, for certain improvements in the manufacture or construction of coats, capes, and other upper garments of personal attire.

67. James Brown, of Bridge-terrace, Canal-road, Mile-End, in the county of Middlesex, machinist, for an improved method of making ships' or other vessels' anchors.

69. William Moore, of Birmingham, in the county of Warwick, gun-maker, and William Harris, of Birmingham, aforesaid, for an improvement in repeating pistols and rifles.

70. Robert Lakin, of Ardwick, in the county of Lancaster, machinist, and William Henry Rhodes, of Gorton, in the said county of Lancaster, mechanic, for improvements in machines for spinning and doubling cotton and other fibrous substances.

71. John Ambrose Coffey, of Providence-row, Finsbury, in the county of Middlesex, pharmaceutical engineer, for improvements in apparatus for performing various chemical and pharmaceutical operations, hereby denominated "Coffey's improved patent Esculapian apparatus,"—parts whereof are applicable to steam-boilers, steam and liquid-gauges, stills, and syphons.

72. Edward Wilkins, of Queen's-row, Walworth, in the county of Surrey, Gent., for improvements in the distribution and application of water or other liquid manure to promote vegetation.

73. Edward Wilkins, of Queen's-row, Walworth, in the county of Surrey, Gent., for improvements in ruling and folding the leaves of account-books or other books used for mercantile purposes, and in making entries therein, and delivering vouchers therefrom, with accuracy and dispatch.

74. Christopher Kingsford, of Buckingham-street, Adelphi, in the county of Middlesex, engineer, for an invention for machinery for solidifying peat, coal, and other substances of a like nature.

75. Laurentius Mathias Eiler, of the kingdom of Denmark, now residing at Leadenhall-street, in the City of London, land surveyor, for an apparatus to release or separate carriages on railroads in case of accident, giving at the same time a signal of distress.

76. Christopher James Schofield, of Cornbrook, Hulme, in the county of Lancaster, Gent., for improvements in machinery or apparatus for cutting the pile of fustians and other fabrics.
77. Stephen Soulby, of Ulverston, in the county of Lancaster, printer, for improvements in machinery for letter-press printing.
78. William Smith, of Kettering, in the county of Northampton, agricultural implement maker, for improvements in machinery or apparatus for cleaning currants, raisins, and other fruits or vegetable substances.
79. Henry Smith, of Stamford, in the county of Lincoln, agricultural implement maker, for improvements in reaping machines.
80. Matthias Walker, of Horsham, in the county of Sussex, ironmonger, for an improved ash-pan, or apparatus for taking up ashes and cinders, and separating or sifting them.
81. Frederick Osbourn, of Albion-street, King's-cross, in the county of Middlesex, tailor, for a machine or apparatus for facilitating the manufacture of various kinds of garments or wearing apparel.
82. Henry Mortlock Ommanney, of the City of Chester, Esq., for improvements in certain parts of machinery for spinning cotton and other fibrous substances.
83. Henry Mortlock Ommanney, of the City of Chester, Esq., for an improved furnace for melting of metals in crucibles.
84. Edwin Pettitt, of Kingsland, in the county of Middlesex, civil engineer, for improvements in the manufacture of ammoniacal salts and manures.
85. Joseph Brandeis, of Great Tower-street, in the City of London, sugar refiner, for improvements in the manufacture of sugar and saccharine solutions.
86. David Dunne Kyle, of Albany-street, Regent's-park, in the county of Middlesex, for an improved method of excavating and removing earth.
87. Robert Robertson Menzies, of Glasgow, in the county of Lanark, North Britain, warehouseman, for improvements in the manufacture of carpets and other fabrics.
88. George Holcroft, of Manchester, in the county of Lancaster, engineer, for certain improvements in steam-engines.
89. James Nichols Marshall, of Bideford, in the county of Devon, bacon factor, for an improved wheel for carriages and other vehicles.
90. John Aspinall, of King William-street, in the City of London, engineer, for improvements in evaporating cane-juice and other liquids, and in apparatus for that purpose.
91. William Walker, of Liverpool, in the county of Lancaster, patent agent, for improvements in wheels for railway carriages, and in the mode or modes of manufacturing the same.
92. Thomas Lawes, of the City-road, London, in the county of Middlesex, for improvements in the manufacture of agricultural implements, or an improved agricultural implement.

93. Thomas Lawes, of the City-road, St. Luke's, in the county of Middlesex, for an improved quilt or coverlid.
94. Thomas Lawes, of the City-road, St. Luke's, in the county of Middlesex, for improvements in generating steam.
95. William Oxley, of Manchester, in the county of Lancaster, merchant and mill furnishing manufacturer, for improvements in apparatus for heating and drying.
96. Henry Bridson, of Bolton-le-Moors, in the county of Lancaster, bleacher, for improvements in machinery to facilitate the rinsing, washing, and cleansing of fabrics; which machinery is also applicable to certain operations in bleaching and dyeing.
97. John Macmillan Dunlop, of Manchester, in the county of Lancaster, engineer, for improvements in the manufacture of wheels for carriages.
98. Thomas Firth, of Shear Bridge Mill, in the township of Horton and parish of Bradford, in the county of York, worsted spinner, for improvements in machinery for preparing to be spun—wool, mohair, flax, cotton, and other fibrous materials.
99. Robert Anderson Rüst, of Regent-street, in the county of Middlesex, piano-forte manufacturer, for improvements in piano-fortes.
100. William Potts, of Birmingham, in the county of Warwick, for improvements in sepulchral monuments.
101. Thomas Allan, of Adam-street, in the City of Westminster, civil engineer, for improvements in the application of carbonic acid gas to motive purposes.
102. George Rennie, of Holland-street, Blackfriars, in the county of Surrey, Esq., for an improved chain cable.
103. Charles Lungley, of Poplar, in the county of Middlesex, ship builder, for improvements in ship building.
104. Martyn John Roberts, of Gerrard's-cross, in the county of Bucks, Esq., for improvements in the manufacture of oxides of zinc and tin.
105. Richard Archibald Brooman, of the Firm of J. C. Robertson and Co., of Fleet-street, in the City of London, patent agents, for improvements in machines for cleaning knives.
106. Thomas Allan, of Adam-street, in the City of Westminster, civil engineer, for improvements in propelling.
107. Henry Columbus Hurry, of Adam-street, Adelphi, in the county of Middlesex, civil engineer, for an improved construction of fountain-pen or reservoir pen-holder.
108. Thomas Fearn, of Birmingham, in the county of Warwick, electro-metallurgist, for certain improvements in ornamenting metallic surfaces, and in machinery and apparatus to be employed therein.
109. William Austin, of Birmingham, in the county of Warwick, engraver, and William Sutherland, of the same place, decorative painter, for improvements in ornamenting glass.

110. John Wright and Edwin Sturge, of the Cornwall-road, Lambeth, in the county of Surrey, engineers, for improved machinery for the manufacture of envelopes.
111. John Remington, of Sloane-street, Chelsea, civil engineer, and Zephaniah Deacon Berry, of Victoria-road, Pimlico, gas fitter and engineer, both in the county of Middlesex, for improvements in gas-meters or apparatus for measuring gas or other elastic fluids.
112. Hermann Turck, of Broad-street-buildings, in the City of London, merchant, for improvements in packing goods.
113. Bernhard Harczyk, of Saint Mark-street, Tenter-ground, Goodmans-fields, in the county of Middlesex, Gent., for an improved preparation or composition of coloring matter, to be used in washing or bleaching linen and other washable fabrics, and in the manufacture of paper and other substances.
114. George Jenkins, of Nassau-street, Soho, in the county of Middlesex, Gent., for improved means of obtaining motive power through an atmospheric engine, by facilitating the attainment of exhaustion by currents of caloric,—the engine being worked by the pressure of the atmosphere.
115. Charles John Carr, of Belper, in the county of Derby, engineer, for improvements in machinery for making bricks and other similar articles.
116. William Bolivar Davis, of Southampton, dealer and chapman, for improvements in ships' buoys, life buoys, ships' fenders, and other similar articles.
117. John Wilson Fell, of Glasgow, in the county of Lanark, North Britain, rope and sail maker, for improvements in preparing and spinning hemp and other fibrous materials, for the purpose of making ropes, twines, and other similar articles.
118. Alexander Stewart, of Glasgow, in the county of Lanark, North Britain, manufacturer, for improvements in the manufacture or production of ornamental fabrics.
119. George Ennis, of Jersey, iron and brass founder and machinist, for improvements in gaffs and booms.
120. George Collier, of Halifax, in the county of York, mechanic, for improvements in the manufacture of carpets and other fabrics.
121. John Lee Stevens, of Kennington, in the county of Surrey, for improvements in furnaces.
122. Duncan Bruce, of Canada, North America, Gent., for improvements in rotary steam-engines.
123. Richard Whytock, of Greenpark, Zibberton, in the county of Mid-Lothian, for improvements in the manufacture of fringes, and of pleat for these and other ornamental work.
124. Richard Husband Heighway, of the New-road, in the county of Middlesex, for improvements in paving roads and other surfaces.
125. Thomas Hunt, of Leman-street, in the county of Middlesex, gun-maker, for improvements in fire-arms.

126. George Bell, of Wellington-street, Goswell-street, in the county of Middlesex, for improvements in saturating canvas and other fabrics, in order to render them buoyant and waterproof.
127. Robert W. Parker, of Roxbury, in the State of Massachusetts and United States of America, for a new or improved mode of giving rotatory motion to a shaft of a circular saw or other mechanical contrivance.
128. William Rogers, of Long-acre, in the county of Middlesex, for improvements in studs, buttons, and other fasteners.
129. Joseph Cox, of Heston, in the county of Middlesex, Gent., for improvements in the manufacture of gates and hurdles.
130. Isaac Westhorp, of George-yard, in the City of London, for improvements in grinding wheat and other grain.
135. Robert Griffiths, of Great Ormond-street, in the county of Middlesex, engineer, for improvements in apparatus for indicating the number of persons entering and the distance travelled in public or other conveyances and places, and for the prevention of fraud upon proprietors of public conveyances.
136. William George Nixey, of Moor-street, in the county of Middlesex, oil and colorman, for improvements in tills and other receptacles for money.
137. Arthur Jackson, of Exchange-court, Liverpool, in the county of Lancaster, for improvements in gas-burners.
138. Richard Atkinson Peacock, of Slyne Lodge, near Lancaster, in the county of Lancaster, civil engineer, for an improved construction of culvert for sewers, for the purposes of drainage.
139. William Lewis, of Piccadilly, in the county of Middlesex, surgeon and apothecary, for improvements in compounding medicines in the form of pills.
140. Thomas Robson, of Woolwich-road, in the county of Kent, for improvements in apparatus for igniting signal and other lights.
141. Astley Paston Price, of Margate, in the county of Kent, for improvements in the manufacture of citric and tartaric acids, and of certain salts of potash, soda, ammonia, lime, and baryta.
142. Henry Bernoulli Barlow, of Manchester, in the county of Lancaster, patent agent and consulting engineer, for improvements in the manufacture of cylinders for carding cotton and other fibrous substances.
143. John Lawrence Gardner, of Whitecross-street, London, ink maker, for improvements in bottles and other vessels for holding liquids.
144. William Seaton, of Coleshill-street, Pimlico, London, for improvements in the construction of iron vessels, and in sheathing or covering the same.
145. Donald Nicoll, of the Firm of H. J. and D. Nicoll, of Regent-street, for improvements in mourning bands for the arm or hat.

146. Edwin Lewis Brundage, of Jewin-crescent, in the City of London, Gent., for improved machinery for forging nails, brads, and screw-blanks.

The above bear date October 1st.

148. Edward William Kemble Turner, of Praed-street, Paddington, in the county of Middlesex, for certain improvements in machinery for sweeping or cleaning chimneys; also for more effectually extinguishing them when on fire.
149. Edwin Whele, of Shiffnall, in the county of Salop, engineer, for an improved rotatory engine, to be worked by steam, air, or gases.
150. Thomas Boyd, of Glasgow, in the county of Lanark, North Britain, calico printer, for improvements in the treatment or finishing of woven fabrics.
151. David Wilkinson Sharp, of Bingley, in the county of York, manufacturer, for improvements in machinery for combing and drawing a sliver of wool, flax, silk-waste, and other fibrous substances; and in apparatus for constructing screws to be used in a part or parts of such machinery.
152. Eugene De Varroc, of Regent-street, in the county of Middlesex, artist, for improvements in rendering glass reflective.
153. David Stephens Brown, of Alexandrian Lodge, Old Kent-road, Surrey, Gent., for an agricultural implement for tilling the soil.
154. David Stephens Brown, of Alexandrian Lodge, Old Kent-road, Surrey, Gent., for obtaining useful products from sewers.
155. David Stephens Brown, of Alexandrian Lodge, Old Kent-road, Surrey, Gent., for an improved means of navigating the water by ships.
156. Joseph Brown, of Leadenhall-street, in the City of London, upholsterer and cabinet maker, for improvements in beds, sofas, chairs, and other articles of furniture, to render them more suitable for travelling and other purposes.
157. James Mayelston, of Elloughton, in the county of York, Gent., for improvements in the method of applying heat to the heating of water for feeding or supplying the boiler or boilers of steam-engines, or for other purposes.
158. Francis Prime Walker, of Manchester, in the county of Lancaster, ironmonger, for improvements in machinery for communicating signals to the drivers of railway engines.
159. Benjamin Fothergill, of Manchester, in the county of Lancaster, mechanical engineer, for improvements in certain machinery for preparing to be spun, cotton, wool, flax, silk, and other fibrous substances.
160. Joseph Burch, of Crag Hall, near Macclesfield, in the county of Chester, carpet manufacturer, for certain improvements in building and propelling ships and vessels.
161. Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of Fleet-street, in the City of London, patent agents,

for improvements in purifying and disinfecting fats and fatty bodies, and in separating oleine from stearine.

162. John Ignatius Fuchs, engineer and watch-maker, of Zerbst, Duchy of Anhalt Dessau, for an electro-magnetic apparatus.

163. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in the manufacture of tables, sofas, bedsteads, stands, chairs, and other articles of furniture, and the frames and bodies of musical instruments.

164. John Robert Johnson, of Stanbrook Cottage, Hammersmith, in the county of Middlesex, chemist, for improvements in fixing coloring matter of madder in printing and dyeing.

165. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in constructing bridges, viaducts, and such like structures.

166. Samuel Powell, of Regent-street, in the county of Middlesex, for improvements in the manufacture of certain articles of wearing apparel.

167. Joseph Faulding, of Edward-street, Hampstead-road, in the county of Middlesex, for improvements in machinery for sawing and cutting wood and other substances.

168. John Macintosh, of Berners-street, in the county of Middlesex, for improvements in compositions to be used as paints.

169. Moses Poole, of Serle-street, in the county of Middlesex, Gent., for improvements in machinery for mowing and reaping.

170. Edward Allport, of Aldermanbury, in the city of London, button manufacturer, for an improvement in the manufacture of buttons, by making them with elastic shanks.

171. William James Lewis, of London, but now residing at Turin, in the Kingdom of Sardinia, civil engineer, but now at Paris, for a slideless stadia sight, applicable to rifles and other fire-arms.

172. John Jobson, of Litchurch, in the county of Derby, iron-founder, for improvements in manufacturing moulds for casting metal.

173. Theophilus Kedwood, of Montagu-street, Russell-square, London, for improvements in the manufacture of gelatine.

175. Michael Cavanagh, of Notting-hill, in the county of Middlesex, locksmith, for certain improvements in mortice-lock spindles.

176. Peter Hyde Astley, of Stratford, in the county of Essex, Gent., and John Figgins Stephens, of De Beauvoir-square, Kingsland, in the county of Middlesex, Gent., for an improved construction for floating vessels, having for its object the rendering them safe means of transit.

177. William Simpson, paper-maker, and John Shelton Isaac, saddler, both of Maidstone, in the county of Kent, for an improved composition, to be used principally as a substitute for wood or other materials, where strength and lightness are required, in the manufacture of various articles.

178. William Edward Newton, of the Office for Patents, Chancery-

lane, in the county of Middlesex, civil engineer, for improvements in stoppers for bottles and other similar vessels.

179. Frederick Newton, of Fleet-street, in the City of London, optician, for improvements in the apparatus to be employed for produciug photographic pictures.

180. John Slack, of Manchester, in the county of Lancaster, manager, for improvements in the manufacture of textile fabrics.

181. William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in governors or regulators for regulating the pressure of gas as it passes from the main or other pipes to the burners.

182. Samuel George Archibald, of Pall-mall, in the county of Middlesex, Gent., for an improved mode of extracting or rendering animal fats and oils.

183. Thomas Green, jun., of Westbourne Park Villas, in the county of Middlesex, omnibus proprietor, for improvements in the construction of omnibuses.

184. Joseph Needham, of Piccadilly, in the county of Middlesex, gun manufacturer, for improvements in breech-loading fire-arms, and in apparatus connected therewith.

185. James Edward Mac Connell, of Wolverton, in the county of Buckingham, civil engineer, for improvements in sheathing iron vessels, and in covering, lining, or coating sheets or other manufactured articles of iron or steel.

186. John Burnie, of Castle Douglas, in the county of Kirkcudbright, North Britain, smith, for improvements in cutting or reducing vegetable substances.

187. Alexander Miller, of Glasgow, in the county of Lanark, North Britain, manager, for improvements in the treatment or finish of textile fabrics and materials.

188. John Weems, of Johnstone, in the county of Renfrew, North Britain, tin-smith, for improvements in obtaining and applying motive power.

189. Alexander Willison, of the Manse of Dundonald, in the county of Ayr, North Britain, minister of Dundonald, for improvements in thrashing machinery.

190. James Anderson Young, of the Firm of A. S. Young and Son, of Buchanan-street, Glasgow, in the county of Lanark, North Britain, surgeon-dentist, for certain improvements in dental operations, and in apparatus or instruments to be used therein.

191. John Stringfellow, of Chard, in the county of Somerset, engineer, for improvements in galvanic batteries, for medical and other purposes.

192. George John Philps, of Friday-street, in the City of London, manufacturer, for improvements in hats and other like coverings for the head.

193. Ralph Errington Ridley, of Hexham, in the county of Northumberland, tanner, for improvements in cutting and reaping machines.

194. Thomas Lawrie, of Glasgow, in the county of Lanark, N.B., glass decorator, for improvements in forming and protecting inscriptions and devices in exposed situations.

195. George Stuart, of Glasgow, in the county of Lanark, N.B., merchant, for improvements in treating the fleeces of natural coverings of sheep and other animals when on the animals.

The above bear date October 2nd.

197. John Gooch Marshall, of Clifton-street, Finsbury, in the county of Middlesex, cabinet maker, for improvements in rendering weather-tight doors, casements, and other similar openings.

200. Edward Welch, of Oxford-terrace, Hyde-park, in the county of Middlesex, architect, for improvements in fire-places and flues, and in apparatus connected therewith.

201. Martin Watts, of Patricroft, near Manchester, in the county of Lancaster, cotton spinner, for certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.

202. William Hayward West, of Blenheim-street, Oxford-street, in the county of Middlesex, ironmonger, for improvements in wind-guards and chimney-tops.

203. Robert Hazard, of Lincoln's-Inn-fields, in the county of Middlesex, warming and ventilating engineer, for a calorific bath.

204. Bendix Ising Jacoby, of Hamburg, dentist, for improvements in the means of fixing artificial teeth.

205. Martin Billing, of Holborn, London, and Charles Henry Street, of Birmingham, in the county of Warwick, brass-founder, for certain improvements in the combination of metals having different capacities of vibration, to be used in the construction of certain useful articles.

206. John Moseley, of Birmingham, in the county of Warwick, engineer, for certain improvements in machinery for cleansing linen and other fibrous materials.

207. William Donald Napier, of George-street, in the City of Westminster, Gent., and William Lund, of Cornhill, in the City of London, manufacturer, for improvements in apparatus for steering vessels.

208. Richard Manwaring, of Maidstone, in the county of Kent, watchmaker, and Thomas Hamblin, also of Maidstone, agricultural labourer, for improvements in ploughs.

209. James Barrow Storey, jun., of Oakham, in the county of Rutland, brewer, for improvements in mouth-pieces for pipes and cigars.

210. Henry Webb, of Willenhall, in the county of Stafford, engineer, and Joseph Froysell, of the same place, surgeon, for improvements in fastening knobs to door and other locks.

211. Thomas Scott, of Drummond-street, Euston-square, in the

county of Middlesex, Gent., for improvements in applying and transmitting motive power, and in accelerating the progress of bodies in motion.

212. Thomas Slater, of Somer's-place, New-road, St. Pancras, in the county of Middlesex, optician, and Joseph John William Watson, of Old Kent-road, in the county of Surrey, Doctor of Philosophy, for improvements in the application of electricity to illuminating purposes.

213. Antoine François D'Henin, of Malines, in the kingdom of Belgium, tobacco manufacturer, for improvements in the treatment and manufacture of tobacco.

214. Thomas Kennedy, of Kilmarnock, in the county of Ayr, North Britain, gun manufacturer, for improvements in obtaining and applying motive power; which improvements, or parts thereof, are applicable to time-keepers and clock-work, and for measuring and registering the flow of water and other fluids, and æriform bodies.

215. John Erskine, of Greenock, in the county of Renfrew, North Britain, felt manufacturer, for improvements in the manufacture of felted and cemented fabrics.

216. Archibald Brown, of Glasgow, in the county of Lanark, North Britain, block maker, for improvements in the construction of sheaves for blocks.

The above bear date October 4th.

217. Michael Angelo Garvey, of Jeffrey's-terrace, Kentish-town, Middlesex, for more effectually dissipating the shock of collision in railway trains, reducing the surfaces exposed to atmospheric resistance, and diminishing oscillation by making portions of the whole of each carriage elastic in every direction, and increasing the power of the carriage to resist severe pressure by means of metallic tubes in its longitudinal angles.

218. William Clark, of Upper-street, Islington, in the county of Middlesex, engineer, for improvements in the construction of screw-propellers for propelling vessels.

220. David Stephens Brown, of Alexandrian Lodge, Old Kent-road, Surrey, Gent., for an improved apparatus or instrument for evaporating or distilling liquids.

221. William Crosskill, of Beverley, in the county of York, civil engineer, for improvements in machines for cutting or reaping growing corn, clover, and grass.

222. Aristide Balthazard Berard, of Paris, in the Republic of France, engineer and Chevalier of the Legion of Honour, for improvements in the construction of jetties, break-waters, and docks, and other hydraulic constructions.

223. John Houston, of Nelson-square, in the borough of Southwark, in the county of Surrey, Gent., for improvements in obtaining motive power when air and steam are used conjointly.

224. John Houston, of Nelson-square, in the borough of Southwark, in the county of Surrey, surgeon, for improvements in metallic spring packings for pistons.
225. Joseph Apsey, engineer, of Blackfriars, in the county of Surrey, for improvements in ship-building, and in machinery for propelling.
226. Diego Jimenez, of Percy-street, in the county of Middlesex, merchant, for improvements in the manufacture of soap.
227. Benjamin Mitchell, of Romsey, in the county of Hants, builder, for improvements in the construction of artificial legs.
228. William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery for boring or cutting rocks or other hard substances, for the purpose of tunnelling through mountains or making other excavations.
229. William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the means of producing a vacuum for various purposes, such as condensing steam, pumping water, exhausting air, or other purposes where a vacuum is required.
230. James Bullough, manufacturer, David Whittaker, overlooker, and John Walmesley, mechanical designer, all of Blackburn, in the county of Lancaster, for improvements in sizing machines.
231. George Walker Nicholson, of Pendleton, in the county of of Lancaster, tool and engine fitter, for improvements in screw-bolts, nuts, and washers, and in the machinery or apparatus for making the same.
232. John Prestwich the elder, Samuel Prestwich, and John Prestwich the younger, all of Tamworth, near Bolton, in the county of Lancaster, spinners and manufacturers, for improvements in machinery or apparatus for cleaning and finishing woven fabrics.
233. William Crook, of Blackburn, in the county of Lancaster, ter, weaver, for improvements in looms.
234. John Balmforth, William Balmforth, and Thomas Balmforth, all of Clayton, in the county of Lancaster, ironmasters, for improvements in steam boilers, and in fixing the same.
235. Adam and John Booth, both of Manchester, in the county of Lancaster, machine makers, for improvements in platting or braiding machines; which machines are applicable to manufacturing webs for making door and other mats.
236. Robert Brown, of Salford, in the county of Lancaster, manager, for an improved taking-up motion, applicable to looms, and other similar purposes.
237. Herm Jäger, of Ludgate-hill, in the City of London, merchant, for improvements in the treatment of cotton and other similar fabrics, by the introduction of chemical agents to supersede the use of dung in the dunging process.

238. William Gilbert Elliott, of Blisworth, in the county of Northampton, Gent., for improvements in the manufacture of bricks, pipes, tiles, and other articles capable of being moulded.

239. Pierre Frederic Gougy, of Castle-street, Leicester-square, in the county of Middlesex, Gent., for improvements in paving streets, roads, and ways.

240. Thomas Turnbull, of Rosemill Bleachfield, Dundee, in Scotland, for improvements in the preparation and treatment of flax, hemp, and other similar vegetable fibres.

241. Jesse Ross, of Keighley, in the county of York, Gent., for certain improvements in machinery or apparatus for combing wool, cotton, silk, flax, and other suitable fibrous materials.

242. William Mackenzie, of Glasgow, in the county of Lanark, North Britain, publisher, and George Blair, of the same place, Master of Arts, for improvements in the arrangement and construction of graduated scales for measuring instruments.

243. Samuel Getley, of Ivy-street, Birkenhead, in the county of Chester, for improvements in water-closets.

244. Joseph Westby, of Nottingham, in the county of Nottingham, for improvements in machinery applicable to the manufacture of lace and other weavings.

245. William Dray, of Swan-lane, London-bridge, in the City of London, for improvements in machinery for reaping and mowing.

246. George Hallen Cottam, of Charles-street, Hampstead-road, in the county of Middlesex, engineer, for improvements in chairs, sofas, and bedsteads.

247. Christopher Nickels, of York-street, Lambeth, in the county of Surrey, Gent., and Frederick Thornton, of the borough of Leicester, in the county of Leicester, designer, for improvements in weaving.

The above bear date October 5th.

249. John Hughes, of Carnarvonshire, Wales, quarryman, for an improved method of constructing roofs and sides of houses, buildings, and other structures.

250. William Armand Gilbee, of the English and Foreign Patent Office, South-street, Finsbury, in the county of Middlesex, Gent., for an improved mode of disinfecting putrified and fecal matters, and converting fecal matters into manure; also applicable to the disinfection of cesspools, drains, sewers, and other similar receptacles.

251. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, patent agent, for improvements in sewing machines.

252. Jacob Tilton Slade, of Pall Mall, in the county of Middlesex, Gent., for an improved mode of driving certain machines, and an improved driving-band or chain to be used therewith.

253. Charles de Bergue, Dowgate-hill, London, engineer, for certain improvements in machinery for punching metals, and for rivetting together metallic plates or bars.

254. Robert Shaw, of Portlaw, in the county of Waterford, in Ireland, cotton-spinner and manufacturer, for pre-arranging, ascertaining, and registering the rate of travelling of locomotive engines, and of railway or other carriages.

255. John Crook, of Manchester, packer, and John Wilkinson Wood, of the same place, manager, for certain improvements in the method of preserving hoop-iron from oxidation or decay.

257. Alexis Delemer, of Radcliffe, in the county of Lancaster, Gent., for improvements in machinery or apparatus for manufacturing piled fabrics.

258. David Chalmers, of Manchester, in the county of Lancaster, manufacturer, for improvements in looms for weaving wire web or cloth by power.

259. George Walker Nicholson, of Pendleton, in the county of Lancaster, tool and engine fitter, for improvements in vices, and in the means or method used for fixing the same.

260. William Coles Fuller, of Bucklersbury, in the City of London, patent spring manufacturer, and George Morris Knevitt, of New York, in the United States of America, but now residing at Argyll-street, New-road, in the county of Middlesex, Gent., for certain improvements in applying India-rubber, or other similarly elastic substance, as springs for carriages.

261. William Abbot, of Bideford, in the county of Devon, malster and brewer, for an improved plough.

262. Robert Mortimer Glover, of Newcastle-on-Tyne, Doctor of Medicine, and John Cail, of the same place, mathematical instrument maker, for improvements in miners' or safety lamps.

263. John Gaylord Wells, of Hartford, Connecticut, in the United States of America, but now of Trafalgar-square, in the county of Middlesex, printer, for an improved construction of self-inking stamping apparatus.

264. Alfred Vincent Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for improvements in apparatus for manufacturing gas and coke.

265. David Collison, of Preston, in the county of Lancaster, cloth looker, for improvements in the construction of shuttle-skewers.

266. Henry Alfred Jowett and Frederick William Jowett, of Sawley, in the county of Derby, engineers, for improvements in apparatus for heating; which improvements are particularly applicable for generating steam, or evaporating solutions, and may be applied for heating purposes generally.

267. Thomas Barker Walker Gale and Jonathan Fensom, of Homerton, in the county of Middlesex, engineers, for improvements in the means of joining or coupling bands or straps.

268. William Crossby, of Sheffield, in the county of York, for improvements in the ventilation of coal-pits and mines, ships' rooms, and buildings generally.

269. William Vaughan Morgan, of Jewin-crescent, in the City of London, merchant, for improvements in the preparation of oils for the purposes of illumination and lubricating machinery.

270. John Grimes, of Coton House, in the county of Warwick, Esq., Captain in the Madras Army, for an atmospheric freezing machine.

271. Joseph Westby, of Nottingham, for improvements in twist lace machinery.

272. Joseph Hill, of Birmingham, in the county of Warwick, stamper, &c., for a machine for stamping metals and forging iron and steel.

273. John Frederick Chatwin, of Birmingham, in the county of Warwick, for improvements in the manufacture of brushes.

274. John Frederick Chatwin, of Birmingham, in the county of Warwick, for improvements in the manufacture of buttons.

275. Alphonse René le Mire de Normandy, of Judd-street, in the county of Middlesex, for improvements in obtaining fresh water from salt water.

276. Francis Warren, of Millbank-street, in the county of Middlesex, for improvements in gas-burners.

277. Admiral the Earl of Dundonald, of Belgrave-road, in the county of Middlesex, for improvements in coating and insulating wire.

278. William Adolph, of Bury-court, St. Mary Axe, in the City of London, for improvements in apparatus for warming and ventilating rooms.

279. James Clark, of Chapel House, Paisley, in the county of Renfrew, North Britain, Esq., for improvements in weaving carpets and other fabrics, and in the machinery or apparatus employed therein.

The above bear date October 6th.

280. William Bissell, of Wolverhampton, for an improved cramp, or improved cramps, for cramping floors, doors, and joiners' and ship work generally.

281. Samuel Perkes, of Walbrook, in the City of London, civil engineer, for certain improvements in the mode of treating skins, hides, leather, and other manufactured and raw productions.

282. John Blair, of Ducie Bridge Mill, Manchester, in the county of Lancaster, for certain improvements in the manufacture of waddings, and in the machinery for making the same.

283. Thomas Greaves, of Manchester, in the county of Lancaster, veterinary surgeon, for improvements in the method or means of obtaining and employing motive power.

284. George Simpson, of Manchester, in the county of Lancaster, machine-maker, for certain improvements in machines or apparatus for weighing.
285. Edwin Pettit, of Kingsland, in the county of Middlesex, civil engineer, and James Forsyth, of Caldbeck, Cumberland, spinner, for improvements in spinning and drawing cotton and other fibrous substances, and in machinery for that purpose.
286. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, patent agent, for an improvement in smoothing irons.
287. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, patent agent, for improvements in steam-boilers.
288. Augustus Waller, of London, but now residing at Bonn, on the Rhine, in the kingdom of Prussia, Doctor of Medicine, for improvements in the means of measuring or ascertaining the quantity of alcohol and other substances in brandy, wine, beer, and other liquids.
289. John Tatham and David Cheetham, of Rochdale, in the county of Lancaster, machine makers, for improvements in rollers or bosses used for drawing or conveying textile materials and fabrics.
290. William Horsfield, of Swillington Mills, near Leeds, in the county of York, miller, for improvements in splitting, crushing, and grinding corn, seeds, grain, minerals, or other substances.
291. Morris Lyons, of Birmingham, in the county of Warwick, chemist, for certain improvements in coating the surfaces of iron.
292. Samuel Rainbird, of Norwich, in the county of Norfolk, builder, for improvements in grappling and raising sunken vessels and other submerged bodies, and in apparatus for that purpose.
293. John Little, of Glasgow, in the county of Lanark, North Britain, ironmonger, for improvements in ash-pans for fire-grates, stoves, and fire-places.
294. Mitchel Thomson, of Plymouth, in the county of Devon, surgeon in the Royal Navy, for improvements in lamps, and in the production of artificial light.
295. Peter Ward, of Oldbury, in the county of Worcester, for improvements in the manufacture of sal-ammoniac and obtaining salts of ammonia.
296. Alfred Trueman, of Swansea, in the county of Glamorgan, manager of copper smelting works, for improvements in obtaining copper and other metals from ores, or matters containing them.
297. Alfred Kent, of Chichester, in the county of Sussex, for improvements in glazing.

The above bear date October 7th.

298. Edward Joseph Hughes, of Manchester, in the county of Lancaster, patent agent, for an improved method of purifying and concentrating the coloring matter of madder, munjeet, and spent madder.

299. Thomas Pascall, of Norwood, in the county of Surrey, tile manufacturer, for improvements in ridge tiles and roofing.

301. Samuel Smith, of Swinton, near Manchester, in the county of Lancaster, manufacturer, for certain improvements in looms for weaving.

302. William Townley, of Bartlett's-buildings, Holborn-hill, in the City of London, engineer, for improved machinery or apparatus for watering and flushing streets, squares, courts, and other localities.

303. George Tillett, of London, Gent., for certain improvements in bedsteads.

304. John Paterson, of Wood-street, in the City of London, manufacturer, for improvements in buckles or fastenings.

305. John Talbot Tyler, of Mount-street, Grosvenor-square, in the county of Middlesex, hatter, for improvements in hats, and in the preparation of plush or other covering used in the manufacture of hats.

306. John Talbot Tyler, of Mount-street, in the county of Middlesex, hatter, for improvements in velouring machines, or machines used by hatters for causing the covering of hats to adhere to the body, and for polishing the nap of hats.

307. George Ennis, of Jersey, iron and brass founder and machinist, for improvements in dredging machines.

308. John Lewthwaite, of Halifax, in the county of York, Gent., for improvements in cards and tickets, and in machinery for cutting, printing, numbering, and marking cards, tickets, and paper.

309. James Yule, of St. Luke's-terrace, in the City of Gloucester, mechanician, for an improved arrangement of sawing machinery.

310. William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of hydraulic rams.

The above bear date October 8th.

311. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, patent agent, for improvements in apparatus for manufacturing soda-water and other aerated liquids.

312. James Bird, of Orchard-street, Portman-square, in the county of Middlesex, for a new manufacture of cement.

313. John Egan, of William-street, in the county of the City of Limerick, for a self-acting flax scutching and hackling machine with horizontal blades or hackles; an incline plane on which flax-holders move; the application of the fan by a cur-

rent of air to press flax against scutching blades or hackles; and spring-catch flax-holders, as per drawing.

314. Richard Husband, of Manchester, in the county of Lancaster, hat manufacturer, for certain improvements in weaving hat-plush and other textile fabrics.

315. Alexander Clark, of Gate-street, Lincoln's Inn-fields, in the county of Middlesex, engineer, and Patrick Clark, of the same place, engineer, for improvements in the manufacture of shutters, doors, and windows.

316. Antoine Burg, of Paris, chemist, for certain instruments, apparatus, and articles, for the application of electro, galvanic, and magnetic action, for medical purposes.

317. William Scholfield, engineer, and Joseph Pritchard, boiler-maker, both of Oldham, in the county of Lancaster, for improvements in steam-boilers.

318. William Maddick, of Manchester, in the county of Lancaster, manufacturing chemist, for an improved method of extracting and concentrating, by evaporation, the coloring and other principles from all substances in which they are contained, and of thoroughly exhausting the same.

319. James Johnson, of Worsley, in the county of Lancaster, Gent., for improvements in heating, ventilating, and sewering cottages or dwelling-houses.

320. John and William Smith, both of Manchester, in the county of Lancaster, dyers and finishers, for improvements in the method or process of dyeing woven or textile fabrics certain colors, and in machinery or apparatus employed therein.

321. Samuel Hardacre, of Manchester, in the county of Lancaster, machinist, for improvements in machinery or apparatus for blowing, scutching, opening, cleaning, and sorting cotton, wool, and other fibrous substances; parts of which improvements are applicable to other purposes.

322. George Gent, of Northampton, in the county of Northampton, grocer, and Samuel Smith, of the same place and county, agricultural implement maker, for a fruit cleaning and dressing machine.

323. Jean Jemot Rousseau, of Castle-street, Leicester-square, in the county of Middlesex, chemist, for improvements in inlaying and ornamenting metal plates, to be used for door-plates, sign-plates, and other purposes to which such inlaid or ornamented plates may be applicable.

324. Thomas Restell, of the Strand, in the City of Westminster, watch-maker, for certain improvements in chronometers, watches, and clocks; part of which improvements is applied to roasting jacks.

325. John Henry Johnson, of Lincoln's-inn-fields, in the county of Middlesex, and of Glasgow, North Britain, Gent., for improvements in composing and distributing type.

326. Charles William Siemens, of Adelphi-terrace, in the county

of Middlesex, for improvements in engines to be worked by steam and other fluids.

327. Jonas Lavater, of Rue Grenelle St. Honoré, in the City of Paris, in France, for improvements in the apparatus for measuring the inclination of plane surfaces and angles formed or to be formed thereon.

328. William Hine, of Derby, corn factor, for improvements in machinery applicable to paddle-wheels, windmills, and other useful purposes.

The above bear date October 9th.

329. Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, patent agent, for improvements in the construction of revolving or repeating fire-arms.

330. Henry Moorhouse, of Denton, in the county of Lancaster, tailor, for improvements in machinery or apparatus for cleaning woollen, cotton, or linen rags and waste; which machinery or apparatus is applicable to cleaning and tempering clay, or other similar purposes.

331. David Laidlaw, of Glasgow, in the county of Lanark, North Britain, iron and brass-founder, for improvements in the manufacture or production of gas-burners.

333. George Searby, of Markham-street, Chelsea, in the county of Middlesex, for improvements in machinery for cutting, carving, and engraving wood, stone, metal, and other suitable materials.

334. George Searby, of Markham-street, Chelsea, in the county of Middlesex, for the cure of smoky chimneys, and the prevention of accumulation of soot in flues.

335. Robert Cochran, of Glasgow, in the county of Lanark, potter, for improvements in kilns.

336. Charles Matthew Barker, of Portsmouth-place, Kennington-lane, in the county of Surrey, for improvements in sawing wood.

337. Henry McFarlane, of Lawrence-lane, in the City of London, for improvements in stoves or fire-places.

338. Robert Lambert, of Goree Piazza, Liverpool, in the county of Lancaster, for improvements in tents.

339. Andrew Edmund Brae, of Leeds, in the county of York, Gent., for improvements in the means of, or apparatus for, exhibiting numbers, letters, dates, or other devices, for various purposes.

340. Henry Dewy, of Taymouth-terrace, Philpot-street, Commercial-road, Stepney, in the county of Middlesex, nautical teacher, for improvements in disengaging ships' boats from their suspending chains or ropes.

The above bear date October 11th.

341. Edward Simons, of Birmingham, in the county of Warwick, tallow chandler, for improvements in lamps.

342. Francis Alexander Victor Michel, of Leicester-square, London, in the county of Middlesex, typographer, for stereotyping in copper by the "galvanoplasty."
343. John William Couchman, of Princes-terrace, Pulteney-street, Barnsbury-road, in the county of Middlesex, for the closing and hanging of swing and other doors by means of the spring and pivots.
346. Samuel Perkes, of Walbrook, in the City of London, civil engineer, for certain improvements in mines, buildings, and sewerage, for effecting sanatory purposes; and treating the produce therefrom.
348. Joseph Humphreys, of Howard-street, Norfolk-street, Strand, in the county of Middlesex, designer, for improvements in metallic and other designs for exhibition in or on shop and other windows and places.
349. Emanuel Wharton, of Birmingham, in the county of Warwick, civil engineer, for certain improvements in metallic bedsteads.
351. Louis Constant Alexandre Vittrant, of Cambrai, in the Republic of France, advocate, for improvements in the preservation of vegetable and animal matters.
352. Thomas Dawson, of Melton-street, in the county of Middlesex, mechanist, for improvements in the means of cutting pile or terry fabrics.
353. Thomas Lacey, of Grafton-street, in the county of Middlesex, engineer, for improvements in apparatus for raising liquids, and in joints for uniting India-rubber and other like flexible tubing.
354. Joseph Walker, of Dover, in the county of Kent, merchant, for improvements in machinery for crushing and bruising malt, grain, and seeds.
355. Peter Warren, of Stratmore-terrace, Shadwell, in the county of Middlesex, paper-maker, for an improved material, applicable to many purposes for which papier-maché and gutta-percha have been or may be used.
356. Joseph Robinson, of Southampton, in the county of Hants, superintendent joiner to the Peninsular and Oriental Steam Company, for improvements in ventilators.
357. Thomas Barnabas Daft, of the Isle of Man, for improvements in inland conveyance.
358. William H. Smith, of the county of Montgomery, and State of Pennsylvania, America, clergyman, for improvements in the manufacture of lava ware.
359. Léon Godefroy, of Paris, in the Republic of France, manufacturer, for improvements in covering or packing rollers for printing fabrics.

The above bear date October 12*th.*

List of Patents

That have passed the Great Seal of IRELAND, from the 17th September to the 17th October, 1852, inclusive.

To Frederick Sang, of No. 58, Pall Mall, in the county of Middlesex, artist in fresco, for certain improvements in floating and moving vessels, vehicles, and other bodies, on and over water. —Sealed 28th September.

Thomas Ellwood Horton, of Priors Lee Hall, in the county of Salop, iron-master, and Elisha Wylde, of Birmingham, in the county of Warwick, engineer, for improvements in apparatus for heating and evaporating.—Sealed 13th October.

List of Patents

Granted for SCOTLAND, from the 22nd September to the 22nd October, 1852.

Robert Burn, of Edinburgh, practical engineer, for a certain improvement in steam-engines.—Sealed 6th October.

Thomas Ellwood Horton, of Priors Lee Hall, in the county of Salop, iron-master, and Elisha Wylde, of Birmingham, engineer, for improvements in apparatus for heating and evaporating.—Sealed 12th October.

Robert McGavin, of Glasgow, merchant, for improvements in the manufacture of iron for ship-building.—Sealed 21st October.

New Patents

SEALED IN ENGLAND.

1852.

To Auguste Edouard Loradoux Bellford, of Castle-street, Holborn, in the City of London, for improvements in the manufacture of boots and shoes,—parts of which said improvements are also applicable to the manufacture of various other articles of dress, —being a communication. Sealed 30th September—6 months for inrolment.

Moses Poole, of London, Gent., for improvements in the manufacture of combs,—being a communication. Sealed 30th September—6 months for inrolment.

Sarah Lester, of St. Peter's-square, Hammersmith, in the county of Middlesex, sole executrix of the late Michael Joseph John Donlan, of Rugeley, Staffordshire, Gent., deceased, for improvements in treating the seeds of flax and hemp, and also in the treatment of flax and hemp for dressing,—being a communication from the said Michael Joseph John Donlan. Sealed 30th September—6 months for inrolment.

Christopher Nickels, of the York-road, Lambeth, manufacturer, and Benjamin Burrows, of Leicester, for improvements in weaving. Sealed 30th September—6 months for inrolment.

Henry Gardener Guion Jude, of Lower Copenhagen-street, Barnsbury-road, Islington, for improvements in the manufacture of type,—being a communication. Sealed 30th September—6 months for inrolment.

Charles Billson, of the borough of Leicester, manufacturer, and Caleb Bedells, of Leicester aforesaid, manufacturer, for improvements in the manufacture of articles of dress where looped fabrics are used, and in preparing looped fabrics for making articles of dress and parts of garments. Sealed 30th September—6 months for inrolment.

Edouard Moride, of Nantes, in the Republic of France, for certain improvements in tanning. Sealed 30th September—6 months for inrolment.

William Hunt, of Stoke Prior, in the county of Worcester, manufacturing chemist, for certain improved modes or means of producing or obtaining ammoniacal salts. Sealed 30th September—6 months for inrolment.

Pierre Armand, Le Comte de Fontainemoreau, of South-street, Finsbury, in the county of Middlesex, patent agent, for certain improvements in washing, bleaching, and dyeing flax and hemp, and in mixing them with other textile substances,—being a communication. Sealed 7th October—6 months for inrolment.

Solomon Andrews, of Perth Amboy, in the United States of America, engineer, for improvements in machinery for cutting, punching, stamping, forging, and bending metals and other substances; which are also applicable to the driving of piles and other similar purposes, and to crushing and pulverizing ores and other hard substances. Sealed 7th October—6 months for inrolment.

Alexander Shairp, of 166, Fleet-street, in the City of London, for an improved cutting and slicing machine,—being a communication. Sealed 7th October—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of Fleet-street, in the City of London, for improvements in knitting machinery,—being a communication. Sealed 7th October—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson and

Co., of Fleet-street, in the City of London, for improvements in the manufacture of sugar, and in the machinery and apparatus employed therein,—being a communication. Sealed 7th October—6 months for inrolment.

John Reed Randell, of Newtyn East, in the county of Cornwall, farmer, for improvements in cutting and reaping machines.—Sealed 7th October—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in steam and other gauges,—being a communication. Sealed 11th October—6 months for inrolment.

Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of Fleet-street, in the City of London, for improvements in mowing, cutting, and reaping machines,—being a communication. Sealed 11th October—6 months for inrolment.

Walter Ricardo, of the firm of A. and W. Ricardo, of the City of London, sharebrokers, for improvements in gas burners,—being a communication. Sealed 14th October—6 months for inrolment.

Thomas Carter, of Padstow, in the county of Cornwall, shipbuilder, for improvements in propelling. Sealed 14th October—6 months for inrolment.

John Field, of Warnford-court, Throgmorton-street, for improvements in transferring and printing,—being a communication. Sealed 14th October—6 months for inrolment.

William Brown, of Heaton, near Bradford, in the county of York, mechanist, for certain improvements in machinery and apparatus for preparing and spinning wool, hair, flax, silk, and all other fibrous materials. Sealed 18th October—6 months for inrolment.

Alfred Vincent Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, mechanical draughtsman, for an improved mode of manufacturing railway chairs,—being a communication. Sealed 19th October—6 months for inrolment.

Joseph Palin, of Liverpool, in the county of Lancaster, wholesale druggist, and Robert William Sievier, of Upper Holloway, in the county of Middlesex, for improvements in brewing, and also in the production of extracts or infusions for other purposes. Sealed 19th October—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for sewing,—being a communication. Sealed 19th October—6 months for inrolment.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improve-

ments in machinery or apparatus applicable to public carriages, for ascertaining and registering the number of passengers who have travelled therein during a given period, and the distance each passenger has travelled,—being a communication. Sealed 19th October—6 months for inrolment.

Edward Henry Jackson, of 12, Litchfield-street, Soho, in the county of Middlesex, machinist, for certain improvements in producing artificial light, and also in producing motive power. Sealed 21st October—6 months for inrolment.

Edward Brailsford Bright, of Liverpool, in the county of Lancaster, Secretary to the English and Irish Magnetic Telegraph Company, and Charles Tilson Bright, of Manchester, in the same county, telegraphic engineer, for improvements in making telegraphic communications, and in instruments and apparatus employed therein and connected therewith. Sealed 21st October—6 months for inrolment.

William Reid, of University-street, electric telegraph engineer, for improvements in electric telegraphs. Sealed 21st October —6 months for inrolment.

William Boggett, of Saint Martin's-lane, in the City of Westminster, Gent., and George Brooks Pettit, of Lisle-street, in the City of Westminster, gas engineer, for improvements in obtaining and applying heat and light. Sealed 21st October —6 months for inrolment.

John Charles Wilson, of the Redford Flax Factory, Thornton, near Kircaldy, in the county of Fife, North Britain, civil engineer, for improvements in the machinery and processes employed in and for the manufacture of flax and other fibrous vegetable substances. Sealed 21st October—6 months for inrolment.

Robert Mc Gavin, of Glasgow, in the county of Lanark, North Britain, merchant, for improvements in the manufacture of iron for ship-building. Sealed 23rd October—6 months for inrolment.

Henry Needham Scrope Shrapnel, of Gosport, for improvements in extracting gold and other metals from mineral and earthy substances. Sealed 23rd October—6 months for inrolment.

James Lamb, of Kingsland, in the county of Middlesex, Gent., and Joseph Menday, of the same place, engineer, for improvements in the construction of kilns for burning or calcining cement, chalk, limestone, and other substances requiring such process; and in the application of the heat arising therefrom to the generation of steam. Sealed 23rd October.

CELESTIAL PHENOMENA FOR NOVEMBER, 1852.

D.	H.	M.	
1			Clock after the ☉ 16m. 18s.
—			☽ rises 7h. 12m. A.
—			☽ pass mer. 2h. 51m. M.
—			☽ sets 11h. 16m. M.
2			Juno stationary
3	7	4	Vesta oppo. ☉ intens. of light 0·66
	23	55	☿ in Aphelion.
5			Clock after the ☉ 16m. 12s.
—			☽ rises Morn.
—			☽ pass mer. 7h. 12m. M.
—			☽ sets 2h. 40m. A.
		41	☽ in □ or last quarter
6	4	17	♄ oppo. ☉
8	1	40	♀ in conj. with the ☽ diff. of dec. 3. 54. S.
9	11	2	☿ in conj. with ♃ diff. of dec. 2. 20. S.
10			Clock after the ☉ 15m. 53s.
—			☽ rises 5h. 2m. M.
—			☽ pass mer. 10h. 41m. M.
—			☽ sets 4h. 5m. A.
	1	51	♀ in conj. with Pallas, diff. of dec. 3. 4. N.
	20		☽ in Perigee
11	4	41	Ecliptic conj. or ● new moon
	5	47	♃'s first sat. will em.
	22	8	♃ in conj. with the ☽ diff. of dec. 1. 53. S.
12	3	53	☿ in conj. with the ☽ diff. of dec. 4. 8. S.
	12	4	♂ in conj. with the ☽ diff. of dec. 2. 26. S.
15			Clock after the ☉ 15m. 9s.
—			☽ rises 11h. 48m. M.
—			☽ pass mer. 3h. 37m. A.
—			☽ sets 7h. 28m. A.
16			Mercury, R. A., 16h. 34m. dec. 24. 9. S.
—			Venus, R. A., 12h. 50m. dec. 3. 27. S.
—			Mars, R. A., 16h. 42m. dec. 22. 56. S.
—			Vesta, R. A., 2h. 36m. dec. 4. 59. N.
—			Juno, R. A., 23h. 58m. dec. 10. 41. S.
—			Ceres, R. A., 13h. 3m. dec. 2. 20. N.
16			Pallas, R. A., 12h. 35m. dec. 4. 14. S.
—			Jupiter, R. A., 15h. 59m. dec. 19. 54. S.
—			Saturn, R. A., 2h. 47m. dec. 13. 29. N.
—			Uranus, R. A., 2h. 14m. dec. 13. 0. N.
—			Mercury pass mer. 0h. 51m.
—			Venus pass mer. 21h. 8m.
—			Mars pass mer. 0h. 59m.
—			Jupiter pass mer. 0h. 16m.
—			Saturn pass mer. 11h. 3m.
—			Uranus pass mer. 10h. 30m.
17	1	33	♀ in Perihelion.
18	2	47	☽ in □ or first quarter
	13	43	Pallas in the ascending node.
	14	36	☿ in conj. with ♀ diff of dec. 1 36 S.
20			Clock after the ☉ 14m. 5s.
—			☽ rises 2h. 21m. A.
—			☽ pass mer. 7h. 46m. A.
—			☽ sets 0h. 13m. M.
	8	20	♀ in conj. with Ceres, diff. of dec. 7. 2. N.
—			Occul. 30, Piscium, im. 13h. 11m. em. 14h 6m.
23	16		☽ in Apogee
	16	59	♅ in conj. with the ☽ diff. of dec. 4. 1. N.
24	10	8	☿ greatest hel. lat. S.
		9	♄ in conj. with the ☽ diff. of dec. 1. 17. N.
	5	33	♃'s third sat. will em.
25			Clock after the ☉ 12m. 41s.
—			☽ rises 3h. 44m. A.
—			☽ pass mer. 11h. 14m. A.
—			☽ sets 5h. 50m. M.
	12	32	♃ in conj. with the ☉
26	6	41	Ecliptic oppo. or ○ full moon
—			Occul. ε in Tauri, im. 8h. 57m. em. 10h. 11m.
27			Occul. 0, Tauri, im. 13h. 57m. em. 15h. 6m.
28			Occul. 3, Geminorum, im. 7h. 55m., em. 8h. 28m.
30			Clock after the ☉ 16m. 14s.
—			☽ rises 6h. 3m. A.
—			☽ pass mer. 1h. 16m. M.
—			☽ sets 9h. 7m. M.

J. LEWTHWAITE, Rotherhithe.

THE

LONDON JOURNAL,

AND

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CONJOINED SERIES.

No. CCLII.

RECENT PATENTS.

To Enrico Angelo Ludovico Negretti *and* Joseph Warren Zambra, *both of Hatton Garden, in the City of London, meteorological instrument makers, for improvements in thermometers, barometers, gauges, and other instruments for ascertaining and registering the temperature, pressure, density, and specific gravity of aeriform fluids and liquid or solid bodies.*—[Sealed 8th March, 1852.]

This invention relates, first, to an improved mode of making registering thermometers, and consists in choking or partially closing the bore of the tube near the bulb, or at any other convenient point. This choking or partially closing of the bore may be effected by placing a short piece of wood, glass, platinum or other wire, or other suitable material, in the bore, or by merely bending or twisting the tube; and the bore is to be closed to such an extent, that although the mercury will pass when subjected to pressure by the expansion of the fluid in the bulb, on an increase of temperature, yet, upon the temperature diminishing, it will not pass again into the bulb until force is applied; but, remaining stationary, will indicate the maximum temperature to which the thermometer has been subjected. A vacuum is created in the tube of the thermometer above the column of mercury; and, consequently, when the mercury, by expansion, has reached any given point in the tube, it will always remain there until it is intentionally removed: whereas, if the upper part of the tube contained

air, the latter would have a tendency to force back the mercury when the pressure, occasioned by the expansion, was withdrawn.

In Plate XI., fig. 1, represents an improved maximum thermometer. In this instance, the choking or partially closing the tube is effected by inserting a piece of wood, glass, or wire in the bore, near the bulb, and then bending the tube, so as to form nearly a right angle. The thermometer scale is made exactly in the same way as in ordinary thermometers; but, sometimes, instead of making it on the wood or metal plate, as shewn at fig. 1, the patentees engrave the scale on the glass tube itself, for the purpose of ensuring greater accuracy; and, in order that the degrees and figures may be more legible on the scale, they make the tube flat, as shewn in fig. 2, instead of round. This mode of constructing glass thermometers of flat glass tube, they also apply to the manufacture of ordinary glass chemical thermometers, as shewn at fig. 3. Fig. 2, likewise represents another method of making the improved maximum thermometers: the tube is flat instead of round, and the choking or partial closing of the bore of the tube is produced by twisting the tube near the bulb, when warm, instead of inserting some substance in the bore.

The second part of the invention relates to water gauges, and is intended to ascertain and indicate the density of water in steam-boilers. This improvement consists in the adaptation of a thermometer, which, by indicating the difference of the temperature of the water at different densities, will effect the purpose. The bulb of the thermometer is enclosed in a small chamber, cup, cistern, or vessel, into which water from the boiler may be made to flow through a branch-pipe and connection. Pure water, under atmospheric pressure, boils at a temperature of 212° Fahr.; but when water holds any body, such as salt or calcareous matters in solution, it will not boil until it rises to a much higher temperature: the thermometric scale, attached to this instrument, can therefore be made to indicate the dangerous points, above which it would not be safe to evaporate the water for generating steam. It will be evident, that if the water, when drawn from the boiler and left merely under atmospheric pressure, indicates on the thermometric scale a degree of temperature above a certain point marked upon that scale, then the engineer will know that the water in the boiler is too highly charged or impregnated with salt or other matters, and must therefore be blown off, until its specific gravity is reduced to a safe point. Fig. 4, is a front elevation, and fig. 5, a longitudinal vertical section of

one of the improved gauges, which is connected to the boiler by a screw coupling *b*, in the same manner as steam or pressure or water gauges are usually connected. The short tube *c*, to which the coupling is attached, is furnished with a stop-cock *d*; and the other end of the tube *c*, enters or is connected to a small open chamber, cup, cistern, or vessel *e*, into which steam and water, from the boiler, can be admitted by opening the cock *d*. A small open overflow-pipe *f*, fig. 4, is attached to one side of the cistern or chamber *e*. When it is required to ascertain the density of the water in the boiler, it will only be necessary to turn the stop-cock *d*, for a few seconds, in order to allow a small quantity of water to enter the cistern or vessel; and then the thermometer *g*, will indicate the temperature of the water, which, if above a certain point, marked "dangerous" on the scale, will give notice to the engineer that some of the dense water should be blown off. It should be here observed, that as the water from the boiler, when allowed to flow into the metal cistern or vessel, will be somewhat reduced in temperature, and would, consequently, give false indications, it will be found advisable to allow the water from the boiler to flow through the instrument and out of the overflow-pipe *f*, for a minute or so, before examining the scale, in order to raise the temperature of the instrument to that of the water in the boiler. When the instrument is brought to the same temperature as the water (which will be seen at once by the mercury in the thermometer tube remaining stationary at a certain point), the stop-cock *d*, should be closed, and the observation made; after which, the cistern or vessel *e*, may be emptied, by simply opening the stop-cock *h*, and allowing the water to run out at bottom.

It is evident that two, three, or more of these instruments can be placed in different parts of a ship (as, for instance, in the captain's, chief officer's, and head engineer's cabins), and being connected with the boiler by a tube, these officers can, at any time, ascertain the density of water in the boiler, and give orders accordingly.

The next part of the invention relates to improvements in the construction of barometers; and has for its object, firstly, the construction of an improved pocket barometer, which consists principally of a vacuum thermometer tube, with an elastic or flexible bulb, made of glass, platinum, horn, tortoiseshell, platinized silver, or other thin flexible metallic or other substance. The external air, by pressing on the elastic bulb, which contains mercury or other liquid material, will

force the latter up the vacuum tube, and indicate the amount of the pressure of the atmosphere,—due allowance being made, as in ordinary pocket barometers, for the expansion of the mercury by changes in the temperature of the atmosphere.

Fig. 6, represents, in front elevation, the most simple form of improved pocket barometer. *i*, is a simple thermometer tube, in which a vacuum is formed above the mercury; and the bulb *j*, being made flat and of thin glass, is sufficiently yielding or flexible to be acted upon by the changes in the pressure of the atmosphere, so as to indicate these changes very visibly on the scale by the rising of the mercury or fluid in the tube. A common thermometer tube *l*, and scale *m*, are placed beside the barometric tube *i*, for the purpose of indicating the temperature of the atmosphere, so that allowance may be made for the expansion of the mercury by means of the sliding scale *n*, when taking a barometric observation. In the instrument shewn at fig. 6, a mean temperature of 60° Fahr. is assumed, and the instrument is set to shew the pressure of the atmosphere at that temperature; but, if the temperature increases or diminishes, then the scale *n*, must be slidden up or down, until the index-point 1, is brought opposite the degree marked on the scale *o*, to correspond to the indications of the thermometer *m*.

Fig. 7, is a sectional representation of another method of carrying out the above improvement. In this case, a thermometer tube *i*, is secured to a metal box, furnished with a thin flexible bottom *p*, made of platinized silver, tortoiseshell, or any other suitable material, such as those above mentioned.

Fig. 8, is a longitudinal section and fig. 9, a transverse section of another method of making the flexible reservoir for the mercury. *q*, is a rectangular wooden or metal frame, covered on both sides with a thin sheet of platinized silver or other suitable material, which must be well secured to the frame *q*, so as to prevent leakage of the mercury. *r*, *r*, are two brass or other metal plates, which are secured to the frame by bolts or screws; and one or more holes are made in the plates *r*, *r*, to allow the atmosphere to act or press on the thin flexible sheet of platinized silver or other material. In all these cases, the atmosphere acts on the flexible part of the cistern, and causes the mercury or other fluid to rise and fall in the tube and indicate the pressure.

The second improvement in barometers relates to a novel mode of constructing a self-registering barometer, and consists in placing small tubes or reservoirs by the side of and parallel with the ordinary barometer tube: one of these small addi-

tional tubes or reservoirs should be placed at the upper and the other at the lower part of the main barometer tube, with which they are both made to communicate by lateral tubes. These additional tubes or reservoirs are furnished with indexes; and, as the mercury flows into and rises and falls in these lateral tubes, the indexes, which are contained therein, are raised or lowered accordingly, and will thereby indicate the highest and lowest point of pressure of the atmosphere within a given time.

Fig. 10, is a front elevation of one of the improved self-registering barometers. *s*, is the main barometer tube, which is closed at top, and is turned up and forms a syphon below, somewhat similar to the tube of an ordinary syphon barometer. *t*, is a side tube, connected at top and bottom, by short lateral tubes, with the upper part of the main barometer tube; and *u*, is a similar side tube, connected at top and bottom, by short lateral tubes, with the lower end or syphon part of the main barometer tube. The upper end of the syphon tube, and also the upper end of the tube *u*, are of course open to the influence or pressure of the atmosphere, although shewn in the drawing as covered up, to keep out dust or extraneous matter. Each of the side tubes *t*, and *u*, are furnished with metal indexes 2, and 3, which will indicate the highest and lowest pressure that has been exerted by the atmosphere within a given time. For instance, when the pressure of the atmosphere increases, it will cause the mercury to rise in the main tube *s*, and also in the side tube *t*, and thereby force up in the latter the index 2; but if, on the contrary, the pressure of the atmosphere should diminish, then the mercury will rise in the syphon part of the main tube, and also in the side tube *u*,—in which latter it will push up the index 3, and thereby indicate the lowest amount of pressure. The barometric scale for the main tube is made in the ordinary manner; but, for the two side tubes, the length of the column of mercury is divided into two portions; and the scales for both side tubes commence from the central line, as in the ordinary syphon barometer.

The last head of the invention relates to instruments for ascertaining the specific gravity of liquids, by their expansion at certain degrees of temperature. The form or construction of instrument which the patentees have found to answer the purpose is shewn at figs. 11, and 12. It consists of a reservoir, cistern, or vessel, which is composed of three principal parts *a*, *b*, and *c*, and is made of thin metal, such as thin sheet-brass, copper, silver, or other metal, and so constructed

as to expose a large surface. The part *a*, forms the upper chamber of the reservoir, and is furnished with a socket *d*, that receives a glass tube *e*, of small bore and open at top, to which is adapted a graduated scale *f*: the scale *f*, and tube *e*, are enclosed in a larger glass tube, to protect them from injury or derangement. The part *b*, *b*, of the reservoir, cistern, or vessel, consists of two hollow columns, that connect the upper part or chamber *a*, to the lower part *c*, which is furnished with a stop-cock *g*, whereby the reservoir or vessel is filled and emptied; and the part *c*, also carries a socket, into which is fixed the tube of a thermometer *h*, the bulb whereof is enclosed in the chamber *c*, of the reservoir.

The instrument is used in the following manner:—A sufficient quantity of the liquid to be tested is poured into a tall vessel, in which the instrument is to be slowly immersed,—the stop-cock *g*, having been previously opened, in order to allow the parts *a*, *b*, *c*, of the reservoir, and also part of the tube *e*, to fill with the liquid to be examined. Upon closing the stop-cock, it will perhaps be found that the liquid extends some way up the tube *e*; and it must therefore be carefully adjusted to the zero point, by opening the stop-cock and allowing some of the liquid to run out, until the surface thereof reaches zero on the scale; but, previous to this adjustment, the instrument must be immersed in a vessel containing water at 62° Fahr., so as to bring the instrument to that temperature. After adjustment at 62°, it must be taken out and quickly immersed in another vessel, containing water at 92° Fahr.,—thereby raising the temperature 30°; and then the amount of expansion of the liquid in the reservoir *a*, *b*, *c*, will be indicated on the graduated scale, which will at once shew the alcoholic strength of spirits, or specific gravity of any other liquid.

The graduated scales of these instruments must be made by experiment; as every instrument will vary in some slight degree from others. The patentees, however, describe a plan which will be found convenient for making these scales; but they do not confine themselves thereto. Zero is an arbitrary point, and merely means the point at which distilled water at 62°, or any other point of Fahr., will stand on the scale. Having filled the instrument with this water, and marked the zero point, immerse the instrument in water at 92°, and mark off the expansion temperature, and call it 100;—then take some alcohol, ascertained to be, say, 60° over proof, and having emptied out the water, fill the instrument to zero with this liquid, and after raising the temperature of the alcohol to

92°, in the manner already explained, carefully mark off the point 60°. Now take other strengths of alcohol, viz., at 50°, 40°, and so on, over proof down to proof, and proceed in the same manner, and mark these points on the scale—using the letter P, for proof; after which, proceed with other and weaker solutions,—that is, those under proof down to 90° under proof; and then the scale will be complete, and will indicate correctly the alcoholic strength of any liquid of any specific gravity between distilled water and alcohol 60° over proof.

The patentees observe, that although they have stated that the examination of liquids, to ascertain their specific gravities, should be made between the temperatures of 62° and 92° of Fahrenheit's thermometer, yet other limits may be employed. However, they prefer those set forth; as, in practice, they have found them the most convenient.

The patentees do not confine themselves to the precise arrangement and construction of parts above described. What they claim is, Firstly,—making a registering maximum thermometer or instrument to indicate and register the maximum temperature to which it may be submitted, in the manner above described,—that is, by choking or partially closing the bore of the tube at any convenient place; so that when, by expansion and by reason of an increase of temperature, the mercury or indicating liquid may be forced beyond this point, it will not return of itself into the bulb, as in ordinary thermometers, but will remain stationary in the tube, until removed therefrom by some external agency. They particularly claim the choking or partially closing thermometer tubes, to effect this purpose, by whatever means such choking or partial closing of the tube may be produced.

Secondly,—as regards water gauges, they claim the instrument above shewn, or any mere modification thereof, in which the density of water, or liquids more dense than water (or, in other words, the amount of salt or other matters it or they may hold in solution or suspension), may be known and indicated by ascertaining the temperature of such liquid or liquids at or above the boiling point,—such instrument being founded on the principle that liquids of different densities boil at different degrees of temperature when under atmospheric pressure.

Thirdly,—constructing pocket barometers, with a vacuum tube of a shorter length than the ordinary torricellian tube,—such tube being furnished with a flexible bulb or cistern, so that the pressure of the atmosphere may act thereon, and cause the mercury to rise and fall in the tube, as shewn and

described. And further, in reference to registering barometers, they claim the use of the lateral or side tubes or reservoirs, to which indexes may be applied to shew and register the highest and lowest points to which the mercurial column may be made, by the variation in the pressure of the atmosphere, to rise and fall within any given time.

Fourthly,—the instrument above shewn and described, or any mere modification thereof, for ascertaining the specific gravity of liquids by their expansion under a given increase of temperature.—[*Inrolled September,* 1852.]

To JOHN MACINTOSH, *of Berners-street, in the county of Middlesex, civil engineer, for improvements in ordnance and fire-arms, and in balls and shells.*—[Sealed 24th March, 1852.]

THE object of the first part of this invention is to fire or discharge a succession of balls from the same gun or other fire-arm, without the necessity for reloading after every discharge. In Plate XI., fig. 1, exhibits a longitudinal section of a ball or projectile, made according to this part of the invention, and to be used with a fire-arm suitably constructed for receiving several balls at one time: which balls are to be fired in succession by the charge that projects the first ball igniting the charge which projects the next, and so on until all are discharged. Fig. 2, is a sectional representation of a pistol, suitable for being charged with several balls at once: in this figure, six balls are shewn; but the number may be varied. The six balls, with their several charges of powder, are to be enveloped by a tube or coating of paper or other suitable material, so that the whole charge may be introduced at once into the barrel of the fire-arm; and after this has been done, a small quantity of powder is put into the barrel, upon the charge, and a wad *a*, of paper or other material is rammed in. On the fore part of the barrel is affixed a nipple *b*, to receive a percussion cap, which is discharged by the blow of a spring *c*;—such spring being previously kept back by a catch *d*, which is drawn away, when it is desired to release the spring, by a connection with the trigger, as indicated by the dotted line *e*.

Each ball is formed with a tube *f*, to contain fuse composition; and in the hind end of the tube, holes are made, to form a communication with the charge in the body of the ball. The patentee states that he does not claim the making

of balls hollow, so that the charges of powder required to project them may be placed within the balls; as hollow balls have before been used. Neither does he claim the discharging of several balls in succession from the same barrel; as this part of the invention consists in constructing balls in such a manner that the discharging of the one most forward shall cause the next charge to be ignited,—the fuse composition regulating the speed at which the balls shall succeed each other. He further remarks that, in making balls of the kind shewn at fig. 1, it is desirable that the fore part should be of iron or other hard metal, and the after part of lead or other soft metal; and although he has only shewn a pistol and balls of a suitable size for the same, it will be obvious that guns or other fire-arms may have balls suitable therefor, and may be properly arranged for discharging the foremost ball.

The second part of this invention consists in a mode of constructing balls or shells to ensure the explosion of the same on all sides, and not forward or backward. The form of ball or shell preferred by the patentee is shewn in longitudinal section at fig. 3. The part g, is made of malleable cast-iron, or of wrought iron; and it is desirable that the two ends g^1, g^2, should be of equal area, and be so tied together that they will not separate when the shell bursts, but cause the force of the explosion to expend itself laterally all round the axis of the shell. h, is a case of paper, which is tied around at *, *, when charged; i, is another case, which is preferred to be made of gutta-percha or lead (though other materials may be used); and the hind end of the case is hollow, so as to expand as the shell is discharged, and fill the barrel, whether plain or rifled. j, is a passage for a fuse, to discharge the materials in the shell; but, in place of this mode of igniting the charge, other modes may be resorted to,—such as employing a detonating cap, placed upon a suitable nipple. The case i, instead of being of the form represented at fig. 3, may be made in two parts, rivetted or fixed together, as shewn at fig. 4; and then only the hind part i^2, need be of soft material, whilst the other part i^1, may be of iron or other hard material.

In place of the ball or shell being cylindrical, it may be spherical, as exhibited, in section, at fig. 5, where the inner part is arranged similarly to what has been before described; but the outer case i, is cast on the other parts, and may be charged through a hole i^3, in the ordinary manner; and the shell may be exploded by the means shewn and before

described, or by any other well known means. To prevent windage, the patentee employs the instrument *k*, (shewn separately at fig. 6,) which may be made of gutta-percha, or gutta-percha mixed with other materials, or lead, or other suitable soft material that will expand and fill the bore when discharged; and although the patentee does not confine himself to the precise form shewn, he says it is important that the instrument *k*, should be in close contact with the ball, which may be attached to it by short metal connexions, and that the instrument *k*, should be capable of in part receiving the charge.

The third part of this invention consists in applying vulcanized India-rubber or other suitable collapsable material to close, water-tight, a hole or opening, up to which a gun may be run below the water-line of a gun-boat or other vessel. *l*, is the hole or opening through which the gun is to be fired; it is fitted with a slide *m*, whereby it may be closed; and it is also furnished with an elastic mouth-piece *n*, of vulcanized India-rubber, the outer part of which is kept closed by its own elasticity. The end of the gun is made conical, and fits into the opening at *o*, which is packed with vulcanized India-rubber. When it is desired to discharge a ball or shell, the gun is run up to the opening and fired through the elastic mouth-piece, which will close immediately after the passage of the ball or shell, not only by reason of its own elasticity, but also from the pressure of the water; and on the gun being run back, to re-load, the slide *m*, is to be lowered, in order to close the opening securely until it is again required to fire the gun.

The patentee claims, First,—the improvements above described, for firing a succession of balls from guns or fire-arms. Secondly,—the mode of constructing balls or shells to ensure their exploding on all sides, and not forward or backward. Thirdly,—the mode of arranging or constructing parts in connection with guns to facilitate their being fired under the water-line of gun-boats and other vessels.—[*Inrolled September,* 1852.]

To John Walter de Longueville Gifford, *of Serle-street, Lincoln's Inn, barrister-at-law, for improvements in fire-arms and projectiles.*—[Sealed 6th April, 1852.]

The first part of this invention consists in causing the breech or back end of a fire-arm to project into the barrel, as indi-

cated by the longitudinal section fig. 1, in Plate XI., instead of being formed concave or flat. The touch-hole is to be formed from the exterior into the breech in such manner that the ignition of the charge may take place in a line with the centre of the barrel.

The second part of this invention consists in making projectiles with internal thimbles of hard metal. Fig. 2, is a longitudinal section of a projectile, constructed according to this part of the invention, and suitable for receiving a charge of powder; fig. 3, is a transverse section thereof; in fig. 1, an external view of the projectile is shewn; and fig. 4, is a back view of the same, shewing the paper covering that is tied over the hind end of the projectile, to keep in the charge of powder. The paper covering is to be perforated with minute holes, so that the powder will not pass through, and yet, when the projectile is rammed down the barrel of a fire-arm into contact with the internally projecting breech, the paper will be readily punctured thereby; and thus a small portion of the charge will be caused to enter into the small cavity in the breech which leads to the nipple. The patentee remarks that it is not new to have the charge of powder within a hollow projectile; and he does not therefore claim the same simply by reason of its being hollow and containing a charge of powder. Fig. 5, is a section of another projectile, which is shorter than the one shewn at fig. 1, and is not intended to contain the charge of powder.

Fig. 6, exhibits the form of the piece of tin plate or other thin metal, which is to be used for making the thimble (*a*, figs. 2, 3, and 5,) on which the projectile is cast; or, if preferred, the thimble may be made from a disc of metal. The thimble is raised by what are called "drawing-through tools," which have been heretofore used for producing like forms in metal. The thimble is placed in a mould, shaped according to the desired exterior form of the projectile, and the melted metal, being then poured in around the thimble, produces the part *b*, of the projectile. This projectile is preferred to be used with rifled fire-arms.

The patentee claims, as his invention, first, the constructing fire-arms with the breeches projecting inwards, as above explained. Secondly,—the constructing projectiles with internal thimbles of hard metal.—[*Inrolled October*, 1852.]

To Emanuel Charles Theodore Croutelle, *manufacturer, of Rheims, in the French Republic, for certain improvements in machinery or apparatus for preparing woollen threads and other filamentous substances for weaving.*—[Sealed 3rd February, 1852.]

This invention consists in improvements in combining machinery for dressing warps, particularly those of woollen yarn. The object of this invention is to cause the yarn to be compressed when under the fluid dressing materials, by passing between pressing rollers, in order to get rid of the air contained within the yarn, which, particularly in woollen yarns, it is very difficult to remove so as to ensure an effectual dressing to such warps by the means heretofore resorted to; but, by causing the yarns to be pressed between rollers whilst under the dressing fluid, and then allowing the yarns to expand under the fluid free from air, the fluid can enter amongst the fibres and effectually act upon the yarns.

In Plate XI., is exhibited a double machine for dressing warps,—the part shewn at fig. 1, being in longitudinal section, and that at fig. 2, in external elevation. The warp-threads *a*, are placed upon rollers *b*, at each end of the machine; from these rollers, the threads are directed by the guide-roller *c*, into the bath or vessel *d*, which contains the dressing material; and they are caused to pass between the three pressing-rollers or cylinders *k*, *l*, *m*, which revolve in the bath,—the threads or yarns being pressed between the upper and under rollers *k*, *m*, when under the fluid, so as to drive out all air therefrom. On coming out of the bath, the threads or yarns are divided into two sets by the rod *e*, and pass through a metal plate *f*, pierced with holes, or through a comb or reed: the threads are divided in this manner to allow each thread to dry without being in contact with the others. Afterwards, they pass through the comb *g*, to the clothed rollers *h*; and they then pass under the roller *i*, to the warp-beam *j*. The cylinders *k*, *l*, are preferred to be of copper, clothed with woollen cloth; and the cylinder *m*, is of copper, without clothing. The pressure of the cylinder *l*, against the cylinder *k*, is obtained by means of a lever *n*, at each end of the cylinder *l*, provided with a counterpoise *p*, which can be moved along the lever *n*, to adjust the pressure. The roller *m*, is pressed against the cylinder *k*, by similar levers *s*, moving on axles *r*, and each furnished with a counterpoise *t*. Only the cylinder *l*, is turned by power,—the cylinders *k*, *m*, being

turned by friction of contact; but this may be varied. The pressing the yarns or threads of a warp between the cylinders *k*, and *m*, has the effect of squeezing the air out of the threads, which causes them afterwards to take the dressing more effectually; and the pressure between the cylinders *l*, and *m*, removes any superfluous dressing. The dressing fluid or paste is placed in the vessel *d*, which is divided into three compartments: the upper compartment *v*, contains the dressing; the middle compartment *x*, contains water; and the lower one *y*, contains either hot air or steam for heating the dressing material. *o*, is the opening for filling, and *p*, the tap for emptying, the compartment *x*; and the cock *z*, admits the hot air or vapour into the compartment *y*.

The patentee does not confine himself to the details above given; but what he claims is, the mode, herein described, of combining machinery for dressing warps.—[*Inrolled August*, 1852.]

To William Edward Newton, *of the Office for Patents, 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the manufacture of coke, and in the application of the gaseous products arising therefrom to useful purposes,—being a communication.*—[Sealed 23rd February, 1852.]

In the distillation of coal for the purpose of obtaining gas for illumination, carbonate and hydrosulphate of ammonia are evolved, but are not usefully employed;—the only products that are preserved being the carburetted hydrogen which comes over with the ammonia, and the coke which remains in the retort. In the ordinary process of manufacturing coke for locomotive engines and other purposes where a superior quality of coke is required, all these gaseous products are wasted; as it has hitherto been found necessary to burn the coal in open coke-ovens or chambers which are only partially closed,—an aperture being left to allow the smoke and gaseous products to escape; and air to support combustion is, during a certain portion of the operation, allowed to enter through small orifices provided for the purpose. By these means, which are well known, a dense coke, of superior quality, is produced, when the process is properly conducted; but the gaseous products which are evolved during the coking process are usually allowed to escape into the atmosphere, and are lost. As it is well known that the waste gaseous

products evolved during the combustion of coal or the manufacture of coke or coal-gas, contain ammonia, carburetted hydrogen, and other valuable matters, various plans have been devised for obtaining and advantageously applying the ammonia and other gaseous products. It has, however, been found that—in the apparatus or processes hitherto employed for this purpose—although considerable quantities of ammonia were obtained, yet the coke produced was much inferior to that made in the ordinary open coke-oven. This arose from the fact that, in order more effectually to obtain the whole of the gaseous products, the oven or retorts were closed; and, by applying the heat below, a distilling operation was carried on: whereas a totally different process takes place in the ordinary open coke-oven. As the coke is, for the reason before mentioned, greatly deteriorated in quality, the value of the process is diminished in a corresponding degree; and in fact, commercially speaking, the process, as far as regards obtaining chemical products, such as the salts of ammonia, has been found practically useless. Up to the present time, therefore, it has been considered preferable to adopt one process for the manufacture of good coke, and another for obtaining the gaseous products from coal.

It seems to be absolutely necessary, in order to obtain good coke, that the oven should not be closed, and the process should, in no degree, resemble a distilling operation. The object of the present invention, therefore, is to take the gaseous products that arise from the coal during the manufacture of coke in the ordinary way, and extract therefrom all the valuable matters they contain.

The improved process consists in bringing the gases which are evolved during the combustion of coal, or during its calcination in an open chamber, and particularly in coke-ovens, into contact with water, acids, salts, and, in fact, any substances which are known to combine with or absorb ammonia; and it also consists in the employment of a pump or aspirator when the draft is insufficient. When there is sufficient draft, a vessel or receptacle containing any substance that will absorb the ammonia, is adapted to the flues or chimney through which the gases escape; so that the products of combustion will pass through the receptacle, and the substance contained therein will retain the carbonate and hydrosulphate of ammonia. In order to impede the draft as little as possible, the substance contained in the said receptacle is placed upon a kind of sieve or strainer, such as is usually employed in apparatus for purifying gas for illumina-

tion, or an apparatus for showering the water down is employed: any other apparatus having interstices for the passage of liquids and gases will answer the purpose.

When the draft is insufficient (and this is generally found to be the case), an apparatus is employed consisting, firstly, of a flue that receives the gas on its exit from the fire-place or oven; secondly, of a receiver, into which the gases are conducted by means of the flue above mentioned, and brought into contact with some substance capable of retaining the ammonia; and thirdly, of a blower, ventilator, or other convenient means of creating a draft. The following apparatus are also employed as accessories:—First, a refrigeratory apparatus of some kind, for the purpose of refrigerating or cooling the gases, and causing them to deposit the soot produced by the condensation of the smoke; secondly, a vessel, placed before the one for the reception of the ammonia, and in which the tar and lamp-black are deposited; and thirdly, a pipe for carrying off combustible gases (such as the carburetted or sulphuretted hydrogen), from the vessel in which the ammonia is separated from the other gases. By this pipe the combustible gases may be conducted to jets or burners under the apparatus employed for the concentration of the ammoniacal salts, or under the subliming apparatus or the steam-boiler, where the heat generated by the combustion of these gases may be usefully employed; and, by means of branch pipes, and jets or burners, they may be distributed under any other apparatus where they may be consumed.

In Plate XII., fig. 1, is an elevation of the apparatus used in carrying out the invention; fig. 2, is a plan view; and fig. 3, is an end view of the same. A, A, are the coking-ovens, of which there may be any convenient number (say twenty); and they are similar in construction to those usually employed in England. *a*, *a*, are the supply and discharge apertures, serving also for the admission of air. a^1, a^1, are short vertical flues, proceeding from the ovens, and terminating in the horizontal flue B, which is about 16 inches wide by 20 inches in depth. Coke-ovens in England are sometimes provided with a similar flue, which usually conveys the gaseous products to the chimney-shaft, and thence into the atmosphere, but may be employed for conveying the gases to the apparatus hereafter described. Of course, where a horizontal flue of this kind does not exist, it must be constructed for the purpose of carrying out the present improvements. This flue should be formed of two small walls *b*, *b*, with a roof constructed of brickwork or masonry (see fig. 4, which represents a section

of the flue); or it may be covered with large slabs of fire-brick, which would enable the processes of cleaning and repairing to be conducted with facility. In order to economize the heat in this flue, the boiler of a steam-engine may, if required, be mounted thereon; or the heat in this flue may be applied to the vessels for the concentration of the salts; or the vessel for the calcination of the soot or the subliming apparatus (if hydrochlorate of ammonia were desired to be produced) may be adapted thereto. The flue B, discharges the gases and other products into the chamber C, which is constructed of brickwork or masonry, and closed hermetically; and is intended to contain the refrigerator D, shewn by dots in figs. 1, and 2. *c, c,* fig. 1, are openings made at the lower part of the chamber C, for the purpose of cleansing it and discharging the lamp-black or soot which is deposited on the bottom of the chamber.

c^1, is a partition for supporting the refrigerator D, but leaving openings c^6, for the passage of the gases; and upon this partition is a cast-iron bar c^3, with a groove or channel, in which the plates or flanges of the refrigerator rest, so as to form a partition, extending from the bar c^3, to the top of the chamber: the only passages open for the gases are under this bar c^3. c^2, is also a wall, built in the same manner as c^1, upon the bed of the chamber C, but forming a partition, with the supports of the refrigerator, the flanges of which take into and rest upon the bar c^4. The openings for the escape of the gases are at c^7, above; and the gases, then descending, pass through the pipe c^5, into the vessel E. This vessel is made either of freestone or lead, or of some other material, lined with freestone or lead; and it is fitted with a false bottom *e*, which is pierced with holes. From the false bottom *e*, to the top, the vessel is filled with very hard pieces of coke, freestone, pumice-stone, or any other substance that is not affected by the action of sulphuric acid; and which pieces, by reason of their irregular form, will leave interstices between them. The acid, diluted with water, is put into the vessel F, which is made of lead or freestone; and it is allowed to flow into the vessel E, through the pipe *f*, which is furnished with a stop-cock to regulate its flow. The dilute acid will fall from the vessel F, in a shower, on to the pieces of coke or freestone contained in the vessel E; and, when percolating through or between these substances, it will meet, in its passage, with the gases which are made to pass from the pipe c^5, through the vessel in a contrary direction. The uncombined gases which remain will make their exit through the pipe e^2, and

pass onward to the ventilator H. By this arrangement, the working of the apparatus will be rendered continuous, and will cause a very large contact surface of gas and acid. The acid descending, drop by drop, and becoming constantly more divided, will meet with gases more or less rich in ammonia, which it will take up or absorb, and thereby reach the lower part of the vessel E, in a saturated state. When this part of the vessel E, has been filled up to the level e^1, the saturated solution will flow through the syphon-pipe e^3, into the leaden vessel G, and thence it will pass into the concentrating apparatus.

H, is a centrifugal or other ventilator, for increasing the draft: it has not been deemed necessary to give a detailed drawing of this first part of the apparatus, as its construction is well known. Any other kind of exhausting apparatus may however, if desired, be employed, instead of the ventilator or fan H: for instance, jets of steam suddenly condensed in a chamber connected with the vessel E, will have the effect of creating a partial vacuum therein, and will draw the gaseous products through the apparatus. The ventilator will draw off the uncombined gases from the upper part of the vessel E, through the pipe e^2, and force them through the pipe I, by which they will be conveyed away; and as they will be found to consist, for the most part, of combustible gases, such as carburetted or sulphuretted hydrogen, they may be conducted under the concentrating boiler or evaporating vessels, and employed as fuel for heating and concentrating the liquid salts of ammonia which have been produced in the vessel E. The pipe e^2, is continued a little lower than the entrance of the ventilator, in order to allow the condensable matters which may be disengaged to be collected in this prolonged part, which is furnished with a discharge-cock, as shewn at fig. 3.

It will be understood, that unless the temperature of the gas is reduced, large quantities of carbonaceous matter, in the form of smoke, will pass into the apparatus; but, by reducing the temperature of the gases, the smoke will be condensed and made to deposit in the form of soot in the refrigerator, whence it may be removed through the openings c. If the gaseous products, highly charged with carbonaceous matter, as given off from the ovens, were allowed to pass through the pipes of the refrigerator, the pipes would quickly become clogged with soot, and thereby greatly obstruct the working of the apparatus; it is therefore indispensable to cause the refrigerating water to pass through the pipes in-

stead of the gases, which become cooled by coming in contact with the cold surface of the pipes.

The refrigerator is composed of a series of flanged pipes of cast-iron, which must not exceed $\frac{3}{8}$ of an inch in thickness, set one above the other in the chamber c. There are two kinds of pipes—the curved ones d^3, furnished with circular flanges, and straight ones d^4, furnished with rectangular flanges, which are bolted together. The gases pass from the flue or chimney B, down into the part *d*, of the chamber c, where they are cooled, by passing between the curved pipes, and deposit the lamp-black or soot at the bottom: the gases then proceed through the opening c^6, into the part d^1, from which they pass through the opening c^7, into the part d^2, and thence, after having come in contact with the curved pipes, they flow off through the pipe c^5, into the vessel E. The refrigerating water enters the pipes at d^5, below, and, after having run through the whole series of pipes, will pass off by the opening above; and it is to be afterwards employed for quenching the coke, supplying the engine, or for any other useful purpose. This arrangement of the refrigerator possesses also the important advantage, that it can be enlarged or reduced in capacity without deranging any part of the apparatus, and almost without interfering with its working.

The patentee states that he does not intend to confine himself rigidly to the arrangement herein shewn and described; nor does he intend to claim the exclusive right to produce ammoniacal salts from the gases evolved during the combustion or distillation of coal. What he claims is, the adaptation to ordinary coke ovens of an apparatus whereby the gaseous products, evolved during the combustion of coal therein, may, without interfering with the ordinary process of coking, be drawn off and conveyed away to a receptacle or chamber, where they may be separated from each other and combined with other chemical agents to form valuable products, or used for some other useful purposes, as above described.—[*Inrolled August*, 1852.]

To Charles Marsden, *of Kingsland-road, in the county of Middlesex, engineer, for improvements in scissors and in thimbles.*—[Sealed 12th November, 1850.]

This invention consists, firstly, in constructing scissors so that they may be used by either the right or left hand with equal facility, and further, that they may cut freely through

out the whole length of the blades, without requiring the side pressure usually exerted by the thumb and finger, which is so injurious to the hand where there is much cutting. In Plate XII., fig. 1, exhibits a pair of scissors of the improved construction. *a*, *a*, are the blades, and *b*, b^1, are the shanks, upon one of which there is fixed a guide *c*, that bears on the surface of the other shank b^1, in order, by its pressure, to keep the two cutting-edges in constant contact during the entire progress of the cut. By this arrangement, the scissors are made to cut to the extreme point, without any danger of the fabric falling in between the blades and becoming ragged at the edges. Guides for effecting this object may be applied to scissors or shears of any size; but the improvement is particularly applicable to shears for cutting cloth and sheet metal. Instead of the guide being fitted to the side of one shank and passing over the other, it may be fitted to the centre of one shank, and pass through a slot formed for the purpose in the other shank.

The second part of this invention relates to improvements in thimbles, and has two objects in view,—first, to construct them in such manner as to admit of the escape of the perspiration from the finger of the user; and, secondly,—to guard the finger from being pricked by the needle or cut by the thread. Fig. 2, is a longitudinal section, and fig. 3, an exter- view of an improved thimble. *d*, is the outer case, formed like the thimbles in general use. *e*, is an inner perforated case, soldered to the outer one at certain intervals; and between the two cases there is left a very narrow space, which opens at top beneath the milled edge of the inner case: thus the perspiration can escape through the perforations and through the space just mentioned. Fig. 4, is a section, and fig. 5, a plan view of another thimble, similar to the preceding, except that the inner case does not extend beyond the outer one, and the narrow space between the cases extends to the edge of the thimble. Fig. 6, exhibits a thimble or guard for protecting the finger from being pricked by the needle or cut by the thread. *f*, is a thin shield of metal, attached to a perforated ring of India-rubber *g*, which is slipped upon the finger into such a position that the needle and thread will slide over the metal shield. This thimble or guard may be used to protect the fingers in knitting as well as in sewing.

The patentee claims, First,—the constructing of scissors and shears so that they may be applied to cutting by either the right or left hand with equal facility, and so also that the cutting-edges are kept in constant contact during the

whole progress of the cut, as above described. Secondly,—the constructing of ventilating thimbles—that is, with an inner case, between which and the outer case a space is provided for the escape of perspiration. Thirdly,—the construction of thimbles for protecting the fingers from being pricked or cut by the needle or thread in sewing or knitting, as above described.—[*Inrolled May,* 1851.]

To Frederick Weiss, *of the Strand, in the county of Middlesex, surgical-instrument maker, for improvements in certain surgical instruments, also in scissors, and other like cutting instruments,—being a communication.*—[Sealed 22nd November 1851.]

This invention relates to improvements in forceps and similar surgical instruments, and in scissors and such like cutting instruments, in which the parts or limbs move on an axis; and it consists in a peculiar mode of combining the limbs of such instruments.

In Plate XII., fig. 1, is a plan view of part of a pair of scissors or other instrument, composed of two limbs, moving on an axis, and combined according to this invention. Fig. 2, is a plan view of that part of the lower limb or blade which carries the axis; fig. 3, is a section taken in the line 1, 1, of fig. 2; and fig. 4, is a section in the line 2, 2, of that figure. Fig. 5, is a plan view of the central part of the upper blade; and figs. 6, and 7, are sections in the lines 1, 1, and 2, 2, of that figure. On the lower limb *a*, is fixed a stud or axis *b*, with a T-shaped head; and in the upper limb *c*, there is formed a circular recess, with an opening *d*, through which the head of the axis can pass, when the two limbs are opened out, so as to occupy the positions indicated by the dotted lines a^1, c^1. The under surface of the T-head is inclined on each side of the axis, in opposite directions; so that when the limbs or blades are closing, the inclines will act upon the bed of the recess and draw the limbs towards each other; whereby, it is stated, that scissors constructed on this plan will cut as effectually when used by the left hand as with the right hand. This mode of combining the parts or limbs also admits of the limbs being readily separated in order to cleanse them.

The patentee claims the mode, above described, of combining the limbs of surgical instruments, also scissors and such like cutting instruments,—[*Inrolled May,* 1852.]

To Henry Graham William Wagstaff, *of Bethnal-green, in the county of Middlesex, candle-maker, for improvements in the manufacture of candles.*—[Sealed 20th January 1852.]

This invention refers, firstly, to the treatment of wicks to be used in the manufacture of candles; and, secondly, to improvements in the means of inserting wicks into candle-moulds, and retaining them in their proper position during the operation of casting the candles.

In carrying out the invention, the wick is first steeped in the usual way to assist combustion; but in the solution employed there is introduced a small portion of gelatinous matter for the purpose of stiffening the wick, to prevent its falling over too much when burning, and also to enable it to retain the form which the patentee imparts to it by passing it, while in a damp state, between heated pressing-rollers. By this means the wick is pressed to the form of a flat band; and this form enables the operator to place it with precision in the candles.

Two or more wicks prepared, as above described, are next passed though a cistern containing wax, tallow, or other fatty matter in a melted state, as shewn in the sectional view, fig. 1, Plate XII. The wicks are wound upon reels *a*, and, passing over tension-pins, enter the cistern *b*, *b*, which is furnished, at that end where the wicks enter, with eyes corresponding to the number of wicks required to be treated; and through these eyes the wicks respectively pass. When they have traversed the cistern for a certain distance, and received a coating of the fatty or other fluid matter contained therein, they are made to take a certain relative position: that is, if but two wicks are being passed through the fatty matter, they are brought together, and thereby form a double wick. When three wicks are intended to be treated, they are passed through three eyes, formed in the end of the cistern, and are, after absorbing a sufficient quantity of fatty matter, then brought together, to form by their section a triangular figure. When preparing four wicks, that end of the cistern at which the wicks enter is fitted with four eyes; and the wicks, after being independently coated with fatty matter, are brought together so as to form, in section, a square figure. In the course of the progress through the cistern of the now combined wicks, they take up or accumulate a sufficient quantity of fatty matter to cause them to become permanently united, though the several wicks are isolated or kept separate

by a portion of the wax, tallow, or other fatty substance remaining between them; and they are drawn out at the opposite side of the cistern to that at which they entered, through an orifice of a suitable size. The wicks then pass into a refrigerating apparatus, *c, c,* consisting of a cold water cistern, fitted with a metal pipe *d.* Through this pipe the wicks are drawn immediately on their leaving the cistern *b,* and thereby a proper amount of consistency is imparted to them. The wicks, thus prepared, can then be cut into lengths suitable for dip or mould candles.

In consequence of the peculiar nature of plait, the tendency of which is to diverge in one particular direction, care must be taken to enter the wicks properly through the eyes, so as to bring them back to back, which will cause them to diverge from the centre of the candle; and this divergence will thereby be maintained throughout the whole length of the wick.

In making dip candles with loops, the patentee employs a novel construction of apparatus in order to effect the coating of the wicks with the melted fat. This apparatus is shewn in side elevation at fig. 2, It consists chiefly of a reel, the radial arms *a, a,* of which carry alternately a plate *b,* whose edges are bent up at right angles and notched, and a flat plate *c,* whose outer edge is notched. The plates *b, b,* are each provided with a row of pins *d, d*: which pins are equidistant from each other and from the opposite edges of the plate. These pins are intended to receive the wick that is to be coated with fatty matter; and the notches in the plates *b,* and *c,* are for the purpose of retaining the wicks at tension in their proper position while undergoing the saturating process. The axle of the reel rests in bearings in a pair of arms *d**, which are capable of rocking on studs *e,* carried by the standards *f.* Jointed loosely to the arms *d**, is a saddle-piece *g,* connected by a cord (running over a friction pulley) to a counter-weight *h,* for the purpose of allowing the reel to be raised and lowered with facility. A winch-handle *i,* is applied to the axle of the reel, by which rotatory motion is imparted thereto; and immediately below the reel a cistern *k,* containing the fatty matter for saturating the wick, is placed. The reel is charged with wicks in the following manner:—The patentee takes a piece of plait, stiffened and flattened, as before described, and, commencing at one side of the reel, places one end of it in the first slit on one of the plates *c*; he then passes it to the corresponding slit on one of the adjacent plates *b,* and round the corresponding peg,—at the

same time giving it a twist, so as to bring it back into the second slit of the pair, in the proper position to ensure the required divergence of the wicks when burning. After this, he brings the plait down to the corresponding slit in the plate *c*, and having again twisted the plait, he proceeds in like manner to fill the next adjoining pair of slits or notches; and so on until the row of slits is full. The like operation is carried on until the reel has been fully charged with plait. When this is effected, a cap *b**, is fitted over each of the plates *b*, for the purpose of keeping the loops clean and free from grease when the wicks are immersed in the fluid fatty matter contained in the cistern. By means of the balancing apparatus, the reel is lowered until a certain portion of the wicks are just immersed in the fatty matter; and it is caused to perform one entire revolution, so that the whole of the wicks will acquire a thin coating of such melted substance. The reel is then instantly raised from the cistern by means of the counter-balance arrangement, and made to perform a few quick revolutions through the air, in order to cool the fat taken up by the wicks. The operation of immersing and cooling is repeated until the wicks have received a sufficient coating to connect together the folds of plait which are to constitute one double wick. When arrived at this state, and sufficiently cool, the wicks are severed by passing a knife along the face of the bar *c*. They may then be removed from the reel and suspended on rods by the loops, and dipped in the same manner as the common dip candles. Wicks thus prepared may be employed in the manufacture of mould candles: in which case the position of the plait must be reversed, in the operation of charging the reel; as the loop, instead of forming the top, will be placed at the bottom of the mould candle.

The next head of the invention refers to the insertion of wicks into the moulds used in making mould candles; which is effected by the employment of improved constructions of frames and their appliances. Fig. 3, represents, in longitudinal sectional elevation, a frame, fitted with several sets of mould-pipes, intended to receive the wax, composition, or fatty material whereof the candles are to be made. This frame *a*, is set at an angle sufficient to facilitate the flow of the melted material which is to form the candles. Affixed to and extending across the frame are plates *b*, *b*, one for each set of mould-pipes *c*, *c*. These plates *b*, *b*, are fixed edgewise, and are pierced with holes, which correspond in number with the number of mould-pipes that form one set, and are exactly opposite the centre of the moulds. The pipes are connected

together in sets by plates or frames *e*, *e**; the former of which, together with the plates *b*, *b*, form troughs *f*, *f*, for the reception of the melted material. The lower ends of the mould-pipes are fitted, as usual, with plungers *g*, *g*, which are pierced centrally to allow the candle-wicks to be passed through them, and have a conical recess corresponding to the shape of the head of the candles to be cast: the use of these plungers, as is well understood, is to effect the discharge of the candles from the moulds. At the upper end of the frame a number of reels *h*, containing the prepared wick, and corresponding to the number of moulds in one set, are mounted; and the frame having been filled with sets of mould-pipes, the wicks are drawn from the reels and severally passed through all the pipes which lie in the same line. When double-wick candles are required to be made from the plait which has been treated as above described, with reference to fig. 1, a needle *i*, having a simple hook at one end (as shewn at fig. 3,), and of sufficient length to reach from end to end of the frame, is employed to thread the wicks into the moulds. This needle *i*, charged with a suitable length of wick, is passed down a line of the mould-pipes, and drawn out towards the lower end of the frame, and with it the double wick;—one end of which wick is secured to a notched plate *k*, at the upper end of the frame; and the other end is secured to a plate *k**, which is capable of moving in guides in the sides of the frame *a*, *a*, and has a tendency to move outwards by reason of a weight *l*, being suspended therefrom, for the purpose of keeping the wicks at a proper tension. The needle *i*, having been recharged, is next passed through a second line of moulds, carrying with it the wick, which it deposits in the mould; and this wick is, in like manner, secured to the tension-plates *k*, and *k**. By a repetition of this operation, all the moulds are charged with the prepared wicks. When this has been effected, the melted material is poured into the several troughs *f*, *f*, whence it will find its way into the moulds, and form a cylinder around the wicks. After the tallow or other material, of which the candles are composed, has remained a sufficient time to cool, the candles are severed from the mass of fatty matter in the troughs, and the wicks reduced to their proper length by means of a knife. The several sets of moulds are next removed from the frame, and the candles discharged therefrom in the usual way.

In manufacturing double-wick mould candles, by the use of two separate wicks, which are to be combined in the act of casting, a slightly modified arrangement of apparatus is em-

ployed. This is, in part, shewn at figs. 4, and 5,—fig. 4, being a partial longitudinal section of a frame, with mould-pipes applied thereto; and fig. 5, a cross section, taken in the line 1, 2, of fig. 4, looking towards the left-hand. The difference between this and the above-described arrangement consists in the addition to the several troughs *f*, *f*, of swing dividing-plates *m*, the axle of which is weighted, to give the dividing-plates a tendency to preserve their erect position. The upper edge of these dividing-plates *m*, (see fig. 5,) is notched, for the purpose of receiving the two wicks which have been passed through the fixed plate *b*, and of keeping them at a given distance apart. By fitting these plates *m*, on a rocking axle, a free passage is made through the several sets of moulds for the passage of the needles, whereby the wicks are drawn into the moulds; as the guide-plates will yield to the thrust of the needles, and when they have passed, will severally rise to their former position, maintaining the wicks in their proper place, as already indicated. The form of needle used for threading in two wicks simultaneously is shewn at fig. 6. The wicks are, in this instance, drawn from reels, as shewn at fig. 3, and are held in tension by the notched plates *k*, and *k**, as before described. In this instance, instead of using but one needle for threading in the wicks, it is found advisable to employ as many needles as there are pairs of notches in one dividing-plate; and the lower end of the frame *a*, *a*, is furnished with a pair of pincers or nippers (constructed as represented at fig. 7,) for laying hold of the ends of the needles, and drawing them out simultaneously from the moulds. These pincers are formed of two plates, which are capable of sliding the one over the other. The plates are formed with slots, which correspond when the plates are in one position, so as to allow of the ready insertion into them of the end of the needles; but when the relative positions of the plates are changed, as shewn at fig. 7, the sides of the slots will grip the needles firmly. The needles being laid hold of by this or analogous means, are simultaneously drawn out of the moulds; and the wicks are sustained therein, in their proper place, by the dividing-plates *m*, *m*.

In the manufacture of three-wick candles, the patentee employs a modification of this apparatus,—the design of which is to yield to the forward thrust of the needles, and to preserve the relative positions of the wicks when inserted in the mould-pipes. Figs. 8, and 9, represent the contrivance adopted for this purpose;—fig. 8, being a side view, and fig. 9,

an elevation at right angles thereto. Affixed to a weighted rod or axis *n*, are dividing pieces *m*, *m*, that stand up in front of the openings in the plate *b*, through which the wicks are passed; and such dividing pieces have a vertical slot in their upper end, and are otherwise shaped as shewn at fig. 9. Connected to an arm of the axle *n*, by a link *o*, is an axle *n**, which carries a series of fingers *m**, corresponding in number to the dividing plates *m*, and fitting into the vertical slots of those plates, but so as to leave a space between the end of the finger and the bottom of the slot. By this arrangement, the holes in the plate *b*, of the trough *f*, are only partially covered,—three openings being left, all equidistant from each other and from a common centre. By means of the counterbalance-weight on the arm of the axle *n*, a tendency is given to the parts *m*, and *m**, to lie close against the plate *b*. On the insertion of the needles (which are provided with three hooks for holding three wicks, as shewn at fig. 10,) the dividing pieces *m*, and *m**, will turn on their axles and admit of the needles passing through the several lines of moulds, as above explained; but immediately the needles have been drawn out of the moulds by the pincers or clipping plates, the dividing plates will assume their former position and retain the wicks, which have been drawn into the moulds, in their proper places. When manufacturing four-wick candles, the arrangement shewn, in front view, at figs. 11, and 12, is used for maintaining the proper relative positions of the wicks. This apparatus consists of slotted swing plates *m*, (which are affixed to a rocking axle *n*, weighted in the manner and for the purpose already explained), and also of a slotted sliding-plate *m**. These plates have a simultaneous action, and are intended to partially cover the holes in the plate *b*, through which the needles are passed;—leaving four openings, equidistant from each other and from a common centre, in which the wicks are securely held; and the fifth or central hole is filled with semi-solid fat or other like material. The plate *m**, is furnished with a guide-bar *p*, into a notch of which a portion of a propelling worm or screw *q*, mounted on the rocking axle, takes, for the purpose of transmitting motion from that shaft to the sliding plate *m**, and effecting the simultaneous movement of the plates *m*, and *m**. In order that the wicks may be threaded into the moulds, the wick-dividing apparatus is brought into the position shewn at fig. 11, whereby a free passage is made for the insertion of the needles. When the needles (which are preferred to be made of the form shewn at fig. 13,) have been properly charged

with wicks and passed into the moulds, they are drawn therefrom by means of the apparatus shewn at fig. 7; and the dividing plates will then close upon the wicks by taking up the position shewn at fig. 12.

The patentee claims, as his improvements in the manufacture of candles, First,—the treating or preparing of plaited candle-wick, as above described; and also the apparatus, above shewn and described, for carrying out such modes of treatment. Secondly, the mode of manufacturing candles having two or more wicks, as above described; and, particularly, the means, above shewn and described, for sustaining the wicks in the candle-moulds or mould-pipes.—[*Inrolled July*, 1852.]

To Richard Blakemore, *of the Leys, in the parish of Ganerew, in the county of Hereford, Esq., M.P., for improvements in the construction of ploughs.*—[Sealed 30th November, 1850.]

This invention consists in the application of an improved form of cutter to ploughs, as a substitute for the ordinary coulter. The coulter or cutter which makes the vertical cut into the earth has been hitherto affixed to the beam or framework of the plough, and descends therefrom into the earth, occasioning considerable friction and becoming quickly clogged with roots, grass, weeds, &c. According to this invention, a flat cutter or blade is attached to the lower part of the plough, so that the cutting is from below upwards, and the cutter or blade is suitably formed to throw off the roots, grass, stubble, &c., whereby the friction is reduced and the clogging of the blade is nearly if not wholly prevented. In Plate XII., is exhibited the nose of a plough, with a cutter *a*, fixed to the land-side thereof. The cutter is made of plate-iron or steel, sharp at the forward edge, and its point precedes the point of the plough-share. The plough to which the cutter is applied, may be of any desired construction. In conclusion, the patentee says, "and it should be understood that to the construction of ploughs, other than the blade or cutter *a*, I make no claim."—[*Inrolled May*, 1851.]

To Edward Hammond Bentall, *of Heybridge, in the county of Essex, ironfounder, for improvements in the construction of ploughs.*—[Sealed 25th March, 1852.]

This invention relates, firstly, to an improved mode of constructing the beams of ploughs, so as to obtain lightness as well as strength, and to effect an economy in the manufacture. Instead of making the beam of wood, and of a solid section, the patentee forms it of two bars of iron, either straight or curved to their proper form; which bars are bolted together, and form a kind of hollow framework; and between these bars the coulters may be fixed, instead of making sockets or employing the usual attachments for them.

The second part of the invention relates to an improved mode of constructing turn-wrest ploughs or double ploughs; by means of which the operation of ploughing, both up and down the field, may be performed with the same facility. Attached to opposite sides of the beam (which it is preferred to construct according to the first part of this invention) is a complete plough; and the handles of the plough are made capable of moving on a fulcrum-pin, whereby they are attached to the hinder end of the beam. At the lower end of the handles is a segmental T-piece, having a hole in it near each extremity, into which a pin is inserted, for the purpose of holding the handles in an elevated position while the operation of ploughing is proceeding. On the plough arriving at the end of the field, it is turned on to its side; and the pin that holds the handles in their elevated position is withdrawn, and the handles are depressed. The horses will then, in turning round, cause the plough to roll over, and the share, breast, and coulter, which were before in an elevated position (standing upward from the top side of the beam), will be made to take up a working position. The handles are now raised to their former elevation, and secured by the pin being inserted into the eye at the opposite side of the T-piece.

The third part of the invention relates to an improved method of securing or fastening the shares of ploughs on to the spit.

In Plate XII., figs. 1, 2, 3, 4, and 5, are sectional views of various forms of bar-iron, which it is proposed to use in carrying out the first part of this invention. Fig. 1, represents sections of two bars of iron, with projecting flanges at the upper and lower edges; fig. 2, exhibits a bar, with two ribs formed on one side in place of the flanges shewn at fig. 1; fig. 3, is a modification of fig. 2,—the only difference being,

that there is but one rib instead of two on the side of the bar; fig. 4, is a modification of fig. 1,—its section being somewhat similar to that of the double T-rail used for railways. The advantage of all these forms is, that the flanges or projections add greatly to the strength and rigidity of the bar, without considerably augmenting the weight. A variety of other forms might be given, having ribs, flanges, or projections made on the side to obtain the same effect; and the patentee does not therefore intend to confine himself to the forms of bars shewn. He also proposes to employ bars having a curved section, as shewn at fig. 5; as very great strength may be obtained by employing this form of bar. In order to make the beams of ploughs of bar-iron of any of the shapes above described, the bar-iron is first rolled in convenient lengths of the required form; and two pieces, of the length required for the plough-beam, having been cut off from a long bar, are brought to the proper shape, by means of a bending machine, without heating them. The two pieces are then firmly connected together by bolts or screws,—a space, of about an inch in width, being left between them, to admit of their receiving the coulter and the frame for the share and breast or turn-furrow. By thus bending or fashioning the beams of a plough, as above described, from bars previously prepared by rolling, both time and labor are economized; and by employing, for this purpose, bars of the form shewn, or others of a similar nature, great strength and rigidity are obtained.

Fig. 6, is a side elevation, and fig. 7, an end view of a double or turn-wrest plough, constructed on the improved plan. The flanged iron beam is shewn at *a*, *a*: in this instance it must, of course, be made straight; but when the flanged iron is employed for forming the beams of single or ordinary ploughs, it should be made of the proper curve. The handles are shewn at *b*, and are connected to the beam by a fulcrum-pin *c*. At the lower end of the handles is the segmental T-piece *d*, at each end of which is a hole to receive the pin *e*, whereby the handles are maintained in the position shewn, until the pin is removed. The frame *f*, passes between the two bars which form the beam, and is firmly secured thereto by screw-bolts or otherwise. It carries two separate and distinct ploughs, which are further connected together by a curved strap-piece *g*, that supports the plough while it is being turned over. The coulters *h*, *h*, are secured between the bars of the beam by wedges; and the guide-wheels *i*, *i*, (of which either two or four may be used) are

secured to horizontal bars or arms *j, j*, attached to the front part of the beam.

The improved method of fastening the shares of ploughs on to the spit is shewn at fig. 8, which represents a plough-share detached. This improvement simply consists in making an oblong or rectangular slot in the top of the share instead of a small round hole, as is usual; and a corresponding slot or hole is made in the spit. To these slots is adapted a a metal wedge, which, when driven into the slots in the share and spit, will wedge up the back of the share firm and tight upon the spit. As, in making the shares, the holes and wedges may not always be of exactly the same size, it will be found convenient, in practice, to insert in the slot a wooden wedge first, and then forcibly drive in the iron or metal wedge, which may therefore be made rather smaller than would otherwise be necessary.

In conclusion, the patentee states that he does not intend to confine himself rigidly to the precise arrangement and construction of parts shewn and described; nor does he intend to claim, in reference to the first head of his invention, the exclusive right to make plough-beams of two plain bars of wrought-iron, connected together by bolts or otherwise. What he claims is, Firstly,—constructing the beams of ploughs of bars of iron, furnished with projecting flanges or ribs at the sides, for the purpose of strengthening the same; and also the use of curved bars, such as those shewn at fig. 5, or any mere modification thereof, when applied to the above purpose. In relation to the second head of the invention, he claims the method, herein shewn and described, for constructing double or turn-wrest ploughs, or any mere modification thereof, in which the frame or frames, which carry the ploughs, is or are firmly fixed by bolts, rivets, or otherwise, direct to the beam, which therefore must be turned over, or upside down, when the uppermost plough is required to be brought into operation. Thirdly,—the use of a rectangular slot and wedge, for attaching the shares of ploughs to the spit, as shewn and described.—[*Inrolled September*, 1852.]

To John Gillett, *of Brailes, near Shipston-on-Stour, in the county of Warwick, agricultural implement maker, for certain improvements in ploughs.*—[Sealed 17th April, 1852.]

The object of this invention is, simultaneously with the act of ploughing, to break up the track made by the horses, and

thereby to prevent the impressions produced by their hoofs from harbouring water underneath the soil that is turned over by the breast or turn-furrow, which would seriously interfere with the productiveness of growing crops. To effect this object, the patentee proposes to employ a forward share, set at the ridge side of the plough, in the line of the track of the horses, or at a little distance to the right of the ordinary ploughshare, and adjusted so as to cut the earth at a line a little below the imprint of the horses' hoofs; and thus it will lighten the subsoil, and leave it in a fit state to receive the slice of earth which is thrown upon it by the breast or turn-furrow of the plough.

In Plate XI., fig. 1, represents, in side elevation, a single-breasted plough, with the invention applied thereto. To the ridge side of the plough-beam *a*, a bracket-frame *b*, is secured, by means of clamps, bolts, and screws, in the usual way of making such attachments; and in this frame a socket is formed for receiving a stem *c*, which is capable of being adjusted to any required height.

Through the lower end of the stem *c*, a pin *d*, passes, and, keyed to that pin, is the forward share *e*. The pin *d*, is capable of receiving an axial motion, and of imparting that motion to the share *e*, as indicated by the dotted lines; but the share is prevented from moving backwards in an opposite direction out of the position in which it is drawn, by reason of a shoulder on the stem *c*, bearing against the back of the share when the latter is in a position for working. To the same pin *d*, a crank-lever *f*, is keyed; and a connection is made between the lower arm of the crank-lever and the share *e*, which will ensure the simultaneous movement of both the crank and the share. The upper arm of the crank-lever is connected by a rod *g*, to a lever *h*, having as its fulcrum a pin on the side of the plough-frame. The object of this arrangement of levers is to admit of the share being raised out of the ground when the plough has arrived at the end of the furrow, so that it may form no obstacle to the turning of the plough. This the ploughman is enabled to effect by drawing back the hand lever *h*, to the dotted position, which will cause the crank-lever to rock with its fulcrum pin, and lift the share into the position indicated by the dotted lines.

A modified arrangement, for obtaining a similar result to that just described, is shewn at fig. 2, which exhibits a partial elevation of a plough fitted according to this invention. In this instance, the stem and share are formed in one piece, as at *a*; and the socketted frame *b*, that carries the share, is

hinged to a clamp *c*, by which it is secured to the plough-beam. *d*, is a check piece, attached to the plough-beam, and intended to prevent the depression of the frame below a given line. An arm projects upwards from the frame *b*, and to it a rod *e*, is attached, which leads to the hand lever, as before explained. When, therefore, the plough has reached the end of a furrow, the ploughman will, by drawing back that lever, raise the frame *b*, on its centre of motion, and thereby lift the share out of contact with the soil.

The patentee claims, First,—the application to turn-furrow ploughs of a forward share for the purpose above set forth. And, Secondly,—the modes, herein described, of mounting the share to admit of its being raised clear of the ground when required.—[*Inrolled October*, 1852.]

To Richard Dover, *of New-street, Spring-gardens, in the city of Westminster, merchant, for improvements in treating sewage, in obtaining products therefrom, and combining such products with other matters.*—[Sealed 16th October, 1851.]

This invention consists in treating sewage matter with an acid or acids, either alone or together with a salt or salts, or other chemical agents, for the purpose of deodorizing it, and depriving it of its putrescent qualities, and also obtaining certain products therefrom.

Muriatic or hydrochloric acid is preferred; but any other acid which will have the same effect may be employed. The chemical agents preferred to be used with an acid are chloride of sodium [common salt] and protosulphate of iron; but chloride of potassium, of magnesium, or of calcium, or any other low-priced chloride, may be employed instead of the chloride of sodium; and for the protosulphate of iron may be substituted the sulphate of peroxide of iron, or any other sufficiently cheap metallic salt, the base of which is capable of being precipitated or separated from its acid by the chemical action of the sewage matter. Besides the salts just mentioned, the patentee prefers to add a portion of protochloride of iron or muriate of iron to the acid, for the purpose of more effectually deodorizing the sewage matter, and depriving it of its putrescent qualities; or the same effect may be obtained by adding a small portion of oxide of iron to the muriatic acid. The acid and other chemical agents may be combined with the sewage matter in any suitable vessel; and

when this has been done, the liquid matter is separated from the solid matter by subsidence and filtration. The filtering material may be charcoal, or any other material or materials which will separate the liquid from the solid parts of the sewage matter. By employing charcoal, gypsum, or other materials capable of absorbing and retaining some of the matters held in solution or mixed with the sewage liquid, the filtering materials may thus be impregnated or combined with matters which may make them available as manure.

The patentee states, that he employs about five pounds and a half of hydrochloric acid, of the usual strength, for every ton of ordinary liquid sewage matter; and when he does not use this acid, he takes an equivalent quantity of some other mineral acid. When he employs protochloride of iron, or muriate of iron, he takes about a pound thereof in lieu of a similar weight of the acid. In cases where hydrochloric acid is used, he prefers to mix the acid with iron filings or oxide of iron (in the proportion of about half a pound of the latter to five pounds and a half of acid) some hours before the mixture is to be used,—stirring the whole frequently to promote the solution of the iron. The requisite quantity of chloride of sodium for each ton of sewage matter is about three ounces, and of protosulphate of iron about six ounces; and these salts are to be dissolved in a quantity of water, sufficient for the purpose, and then mixed with the acid. The necessary quantity of acid mixture is gradually added to the liquid sewage matter as the latter is run into a suitable vessel,—the flow of the sewage matter into the vessel being sufficient to cause the whole to be mixed with the requisite proportion of the mixture. If chloride of potassium, or magnesium, or other similar chloride be employed, the quantity must be about the same as that of the chloride of sodium; and when any other suitable salt is substituted for the protosulphate of iron, the quantity used should be about the same as that of the protosulphate of iron.

The solid sewage matter, obtained by filtration, may be used as manure, either alone or in combination with other substances; but it is preferred to mix such solid sewage matter with the filtering material, whereby it was separated from the liquid sewage, and which has become impregnated as before mentioned. The solid products may be mixed with any other matters, so as to form other compound manures: for instance, the solid products may be mixed with refuse animal matters, shale, marl, or any other material having the requisite fertilizing powers, Instead of using the solid parts of

sewage as manure, they may be subjected to any chemical process to obtain chemical or other products therefrom. The filtered sewage liquid may also be submitted to any process for obtaining ammoniacal salts or other products therefrom; or such liquid may be used for fertilizing land.—[*Inrolled April,* 1852.]

To JAMES MATHER *the younger, of Crow Oaks, Pilkington, in the county of Lancaster, bleacher, and* THOMAS EDMESTON, *of the same place, calenderman, for certain improvements in machinery or apparatus for scouring, finishing, and stretching woollen, cotton, and other woven fabrics.*—Sealed 5th September, 1850.]

THIS invention consists in a novel mode of operating upon fabrics, whereby the patentees are enabled to gain, in a more efficient manner, that appearance which is commonly known as the "beetle" or linen finish,—the fabric, at the same time, being subjected to a stretching action; and the same principle of operation is also applicable to the "fulling" or scouring and finishing of woollen cloths. The peculiar character of the operation consists in the use of a roller, which is caused to move to and fro upon the fabric under operation, in the direction of the width thereof.

In Plate XII., fig. 1, is a side elevation of the machine complete, and fig. 2, is an end view thereof. The framework is shewn at *a*, and the main driving-shaft at *b*, upon which there is mounted a spur-wheel *c*, taking into another affixed to a transverse shaft *d*. On the shaft *d*, there is a disc *e*, having a slot formed therein, which receives a pin *f*, coupled to a connecting rod *g*, the other end whereof is jointed to one arm of a vibrating framework *h*. This framework is mounted upon a shaft *i*, at its lower end, and is connected, at the upper part, to rods *j*, *j*, coupled together by a bar *k*; and upon the inward ends of the rods *j*, *j*, is mounted the axle of a roller *l*. As the shaft *d*, revolves, the crank-pin *f*, is carried round, and, through the intervention of the rod *g*, causes the framework *h*, to vibrate upon its centre, and thus impart a backward and forward motion to the roller *l*,—the extent of which motion may be regulated by the situation of the pin *f*, within its slot. At each end of the framework there is a short standard *m*, within which are placed brasses, capable of sliding up and down therein, and carrying the axle of a longitudinal roller *n*. The brasses are supported by screws *o*,

which work in nuts affixed to the framework; so that, by turning the said screws, the roller *n*, may be raised or lowered, and adjusted in a horizontal direction. Upon a cross shaft *p*, there is affixed a worm *q*, taking into the teeth of a worm-wheel *v*, which is mounted upon one end of the axle of the roller *n*; and the shaft *p*, also carries a ratchet *r*, within the teeth of which is a click, projecting from a lever *s*, which is mounted so as to turn loosely upon the shaft *p*. To one of the rods *j*, is attached a projecting piece *t*, which, being thus carried forward simultaneously with the roller *l*, comes in contact with the lever *s*, and, by turning it upon its centre, causes the click to turn the ratchet-wheel *r*, partially round; and this movement operating through the worm *q*, and wheel *r*, effects a slight revolution of the roller *n*. Upon the return-motion of the roller *l*, the piece *t*, will allow the lever *s*, to be brought back to its former position by the weight *u*.

The operation of this machine is as follows:—The fabric to be finished is wound upon the roller *n*; for which purpose the roller *l*, is to be kept up, and the handles of the screws *o*, turned so as to lower the roller; and after the cloth has been wound upon it, the roller is to be again raised, and the transverse roller *l*, allowed to press upon the coil of cloth. The main shaft being then put in motion, the crank-pin *f*, will cause the roller *l*, to travel to and fro upon the surface of the material wound upon the roller *n*. At each forward motion the piece *t*, by coming in contact with the lever *s*, will move the ratchet-wheel *r*, and consequently impart a slight rotary motion to the roller *n*, so as to bring a fresh portion of the surface of the cloth under the rolling operation; and so on until a sufficient pressing has taken place to effect the required beetle or linen finish,—at the same time, by means of the roller *l*, travelling in the direction of the width of the fabric, it will become stretched. The cloth to be thus treated may be placed upon the roller *n*, in a moist or dry state, as desired; and it may be either previously calendered or submitted to the improved process only. It may be subjected also to the action of heat, by causing steam to enter the interior of the roller, or by other suitable means;—woollen cloths may be thus treated, in order to gain the effect of ordinary hot-pressing. When the improved machine is used for scouring or fulling woollen or other cloths, the roller *n*, is placed in a trough and partly immersed in soap and water or other such fluid: which fluid may be kept at the proper temperature by the application of steam, or by other methods commonly in use for such purposes. By thus scouring the woollen or

other goods, they will, by the same operation, be kept stretched in the direction of their width.

The patentees state that, if desired, a flat surface may be substituted for the roller *n*, and the fabric caused to travel thereon so as to present fresh points for pressure; and they also observe that many modifications of machinery may be employed for embodying the spirit of their invention. What they claim is, the application of a roller, pressing upon the material and travelling in the direction of the width thereof, for the purpose of scouring, finishing, and stretching woollen, cotton, and other woven fabrics.—[*Inrolled March,* 1851.]

To PETER FAIRBAIRN, *of Leeds, in the county of York, machinist, and* JOHN HETHERINGTON, *of Manchester, in the county of Lancaster, machinist, for certain improvements in moulding for casting pipes, railings, gates, agricultural implements, and other metal articles; and also in preparing patterns or models for the same.*—[Sealed 10th February, 1851.]

THE patentees commence by stating, that in the specification of certain letters patent, which were granted to them on the 31st of July, 1850, they described a method of constructing and applying patterns or models for moulding preparatory to casting parts of machinery employed in preparing, spinning, and manufacturing fibrous substances,—the feature of novelty consisting in the use of a plate or diaphragm, placed between divided portions of the patterns; and, in pursuing that method of moulding, they have discovered that (under certain modifications) the process is capable of being usefully applied to the production of cast metal articles generally; such, for instance, as pipes, railings, gates, parts of agricultural implements, and other entire articles, or portions of articles, plain or ornamental.

The method of carrying this invention into practical operation is as follows:—The model or pattern of the article from which a mould is to be made is divided in a line corresponding with its broadest face; and the parts thus separated are attached to opposite sides of an intermediate plate, so that they shall be coincident, or have the same circumferential relation to each other that they had before the model or pattern was divided. In order to illustrate this, reference must be had to Plate XI., where fig. 1, represents an edge view of the pattern of a wheel, such as is ordinarily used for carrying the

knives of a chaff-cutting machine; and in fig. 2, a plan view of the pattern is exhibited. This pattern is divided into two portions, in the direction of the dotted line in fig. 1; and the halves are attached on either side of a plate B, (shewn in plan view at fig. 2, and in edge view at fig. 3,) so that the two shall be perfectly coincident in position. This plate is then applied between upper and lower mould-boxes C, of the ordinary construction; and it is retained in a correct position by passing the guide-pins D, through lugs formed upon the plate. The parts being thus adjusted, the ordinary process of ramming sand into the lower mould-box will produce a half mould, the counterpart of the pattern in contact with the sand. The upper mould-box is next, in like manner, rammed with sand, whereby the impress of the second half of the pattern is produced. The plate B, with its pattern, is now lifted, and with it the top box, from which the pattern is then to be removed. After this has been done, the mould in the two boxes may be put together as usual; and it will then be ready to receive the molten metal, which may be poured in through an aperture formed in any convenient situation, as usually practised.

For the purpose of facilitating the moulding of small articles, the patentees provide mould-boxes of any convenient size, and, on either side of the plate B, they secure the divided parts of the models or patterns, so that the corresponding parts of the several patterns shall be coincident with each other, as above explained. Thus fig. 4, represents a plate containing several models to be applied to one set of mould-boxes,—E, F, G, H, representing respectively the patterns of a portion of an agricultural harrow, an ornamental balustrade, a railing, and an ordinary pipe. The models are so arranged that the greatest number may come upon a given size of plate; and the patterns of such articles as will be required to be cast in approximating numbers are selected and put together; and then to the plate is attached a raised piece I, which branches outwards in various directions, and forms a connection with all the patterns. This piece I, is intended to indent the sand in such a manner as to form a gutter or channel for the flow of the molten metal to the several cavities formed in the sand by the different patterns contained on the plate. If, therefore, the metal is poured into this channel, through an opening left in the ordinary manner, it will flow directly into and fill up the cavities formed by the patterns of the articles intended to be cast. It then only remains, when the metal has cooled down, to remove the castings from

the sand, and separate the several articles from the refuse metal.

In the above description it will be understood that reference has been had merely to the moulding of such patterns as would allow of the sand leaving them when lifted in the direction of the guide-pins of the mould-box; but to those who are practically acquainted with the operation of moulding, it will be apparent that, by fitting loosely to the pattern-plate such parts of a pattern as will form an overhanging projection (or what is technically termed an "under-cut"), and will not therefore leave the sand like the patterns above described, the more intricate operations of moulding may be easily performed. In this case, the pattern-plate is first removed from the sand, and the loose pieces or remaining portions of the pattern are then carefully withdrawn, as in the ordinary mode of moulding such under-cut or overhanging parts. The patentees also remark, that articles which are to be cast hollow must be provided with cores, applied in the usual manner after the pattern-plate has been removed.—[*Inrolled August*, 1851.]

Scientific Notices.

THE EXCISE AND THE DRAWBACK ON EXPORTED BEER.

We had occasion some months ago to animadvert rather severely upon the unjustifiable conduct of the Excise authorities in reference to the drawback allowed by law upon the exportation of beer. We then demonstrated that the mode in use by the Excise for determining the original strength or gravity of a beer-wort was defective, and led to erroneous results; which results were highly injurious to the honest claims of the brewer. It would seem that, as our censures were not without cause, so they have not been without effect; for the Excise authorities have instituted an enquiry into this subject through the agency of Professors Graham, Hofmann, and Redwood; the immediate consequence of which is, the adoption of a plan almost identical with that recommended by ourselves, and the silent condemnation of the plan hitherto used by the Excise. We say silent condemnation—for the Report of the three gentlemen above named carefully avoids any expression of opinion upon this question, and merely

deals with the matter as it were *ab origine*. The very care taken to hide the delinquencies of the old plan only adds, however, to the weight of the evidence against it; and, without entering more minutely into this unfortunate subject, we need but point out the plain fact, that Messrs. Graham, Hofmann, and Redwood have found it necessary to compile new tables, to enunciate new principles, and to write a report upon original gravities of no less than 27 octavo pages, for the future use of the Excise authorities. After this, we believe few of our readers will come to any other conclusion, than that the mode previously employed must have been as we described it; for the publication of the new process would be a piece of superfluous extravagance and folly, on the part of the Excise, had the old method been otherwise than grossly incorrect. If the old process was sufficient, why has a new one been found necessary? The conclusion is inevitable, and the corollary of more importance than the argument upon which it is based; for, if the old process was imperfect, as it clearly was, then who has suffered, and to what extent? Many thousands of barrels of beer, of the proper strength to claim a drawback, have been exported and the drawback refused, in consequence of the declarations of the Excise officers that the beer was not of sufficient strength according to the experiments of these *dilettante* operators. Thus some thousands of pounds have been illegally withheld from the most respectable firms in the kingdom, and an almost inconceivable amount of discontent, annoyance, and litigation caused to the industry of the country, merely because those placed at the head of the Excise department have been as largely imbued with conceit and obstinacy as their inferiors are with ignorance and presumption. Returning, however, to the pamphlet before us, we find, in the first instance, that a very decided distinction is drawn between the effects of fermentation upon cane-sugar, grape-sugar, and malt-extract, so much so indeed that separate tables of gravity have been calculated for each of these substances. Then again, the differences between starch-sugar, dextrine, and caramel are acknowledged and commented on. The change induced in the extractive by the act of fermentation is also noticed; and the necessity for ascertaining the amount of acetic acid, and the means of converting this theoretically into sugar, duly enforced for the first time upon the attention of Excise officers. As regards this latter particular, however, we find an alteration in the data we recommended for the same purpose,—which alteration is not chemically correct. The framers of the Report have as-

sumed acetic acid at the equivalent of 60 instead of 51, which we had assigned it, and which is the real atom of acetic acid. The number 60 no more represents the atom of acetic acid than the number 49 would represent that of sulphuric acid; and, unless the operators were afraid even of the suspicion of having followed our footsteps, we cannot conceive a reason for this erroneous estimate. It is nevertheless very satisfactory to find our censures corroborated by such authority; for it is now decided that, "in the examination of fermented liquids, the acetic acid present should not be overlooked, as the influence of this constituent upon the original gravity of some kinds of beer is often considerable." Our readers will perhaps remember that we expressed this very opinion several months since. The evaporative method hitherto in use by the Excise, for determining the amount of spirit in a beer, is very fully discussed; and a rather clumsy attempt is here made to gloss over the unavoidable errors of this absurd process. With this view, the presence of carbonic acid in the beer is made to be of no consequence, and to "have little influence on the result." But against this we will quote the words of Berzelius, in speaking of this very process, which he justly ascribes, not to Balling, but to its real inventor Tabarié, who gave it the name "ænometer." Berzelius says, "After having determined the specific gravity of a spirituous liquor, which ought *not* to contain carbonic acid, we boil it until all the alcohol is volatilized, and then restore it to its original volume by the addition of distilled water;—the difference in specfiic gravity will then represent a number, which substracted from 1000 will give the specific gravity of an alcoholic solution of the same strength as the spirituous liquor." The necessity for the non-existence of carbonic acid is however clearly insisted on, and with perfect justice, even in hands like those of Berzelius. What, then, shall we say when mere Excise officers are the operators? Simply that the process should never be used to determine so great a commercial question as the original gravity of beer-wort. Nor are we at all reconciled to it by the empirical table, appended with a view to justify its adoption. Even if this table would yield correct results in the hands of an experienced chemist (and we are very far indeed from admitting that it will), still when used by such individuals as are generally intrusted with these operations by the Excise authorities, we know that the results must be altogether fallacious and worthless. In point of fact, several excellent manipulative chemists have tried to use, not only this, but even the lately improved

process, with the tables now before us; and in every case disappointment and failure have ensued. The only method that can be relied on, as approaching to accuracy, is precisely that pointed out in this Journal at the commencement of our observations on the beer question.* That is to say, the distillation process, respecting which, as contrasted with the old method, Professors Graham, Hofmann, and Redwood, do not hesitate to admit, "although the evaporation process is the easiest in practice, yet it does not appear to admit of the same degree of precision as the distillation process. In two experiments made upon the *same beer*, a difference of 0·4 or 0·5 degrees of original gravity is not unusual with the evaporation, instead of the coincidence, almost perfect, which holds in the repetition of the distillation." After such an admission as this, we feel that it is unnecessary to say one word concerning the imperative necessity of resorting to the distillation process, as the only accurate means of determining a commercial question of the vast importance which this beer analysis implies. The interests of truth and justice, the welfare of trade, and the commonest principles of propriety and honesty, are all included in the adoption of a correct system of analysis. Who cares about the superior facility of the one process over the other, unless both were rigidly exact. Are the bulwarks of our commercial industry to be pulled down, because Excise officers are ignorant? Must our export trade languish because distillation requires some care and skill? It appears that the complete "process has given results which are remarkably uniform, and is valuable in the scientific investigation of the subject, although not of that ready and easy execution which is necessary for ordinary practice, and which recommends the former method." Was ever the interest of a great and rising branch of industry treated with half the flippant folly embodied in this paragraph?—"not so ready and easy" where thousands of pounds are at stake! So the trading community of Great Britain must rest content with injustice, and see themselves defrauded, because the means of obtaining their rights are not so "ready and easy" as the mode by which they are wronged! But this is not the age in which the facility of a process can safely constitute its only recommendation. Sufficient has been shewn, and, moreover, admitted, to prove that vast wrong must have arisen from the "ready and easy" mode in which this important subject has hitherto been treated by the Excise; nor is it at all likely that the public will now rest contented with the adoption even of

* See Vol. XL., p. 122.

a process involving a little more labor, but still cut down, on the Procustean system, to the limited intellects of Excise officers. Nothing short of a parliamentary inquiry can now reconcile the brewing interest to any process whatever, or restore the confidence which has been lost. The grand question still remains for solution,—Can common Excise officers be intrusted with the management of so serious a matter as that of adjudicating between the interest they serve and the interest of the fair trader? In the first place,—are they qualified, by skill and knowledge, for such a task? and, in the second place,—is it in accordance with the constitutional principles of this country, that a party shall be both witness, counsel, judge, and jury, in his own case, more especially when there is no appeal from his decision? We know the answer to to these questions which Great Britain will pronounce, and rely, with perfect confidence, on the good sense and love of justice which characterize the British people.

We are in a condition to prove that large quantities of beer, brewed from wort, which it will be sworn on oath, by unexceptionable witnesses, was of the full legal strength, has been refused the drawback or allowance of duty by the Excise. This drawback now amounts to several hundreds of pounds in one instance only; and every attempt has been made, consistently with honor, to obtain redress, but hitherto without avail; and, singularly enough, there exists no legal tribunal for awarding justice in such cases. We are a good deal in the habit of alluding to Russia and Turkey as examples of despotism and oppression; but there is a Russia much nearer than that which acknowledges the authority of the Czar, as a very casual acquaintance with Broad-street will testify; and in nothing has this despotic and arbitrary principle been more offensively exhibited than in the whole conduct of the Excise throughout the working of the drawback on beer.

We may find occasion, ere long, to return to this subject.

INSTITUTION OF CIVIL ENGINEERS.

November 9th, 1852.

The business of the First Meeting of the present Session was commenced by the announcement of the dates of the Ordinary Meetings; of the appointment of December 21st, for the Annual General Meeting for the Election of the President, Council, and

Officers; and of the 31st of May, 1853, for the President's Conversazione.

The paper read, was "*On the improvement of tidal navigations and drainages,*" by Mr. W. A. Brooks, M. Inst. C.E.

The object of the communication was chiefly to elicit observations from members and the narration of facts which might be usefully employed, hereafter, in an investigation into the laws which govern the flux and reflux of the tide in estuaries. The author, after alluding to the impediments to improvement, arising from the popular prejudice against such constructions as would appear, by their bulk, to diminish the space for the tidal water, proceeded to shew, with how little reason the hacknied phrases, "encroachment upon navigation," and "abstraction of tidal water," were applied, indiscriminately, to works which the experience of engineers pointed out as adapted to ameliorate the flow and ebb of tidal waters.

He then shewed that estuaries were of two classes. The first and best kind were bounded by shores gradually receding from each other, as they approached the ocean, with their navigable channels bearing a large proportion to the full breadth of the stream at high water, as in the case of the Thames, &c.

The second and inferior kind had tortuous channels, of uncertain and varying capacities, and with great disproportion between their relative widths at low and at high water.

The first class afforded perfect drainage to the country, on account of their capacious low-water channels, in which the declination of surface was very gentle. The transmission of the tidal wave was therefore quick, and it was able to turn early, and attain a head to overcome the ebb; so that the interval of stagnation, or rest at sea, was very short,—which last was the best test for the general good state of a navigation. At the mouths of such rivers there were rarely any bars.

The features of the second class of estuaries were directly opposed to those of the first class. The body of water was generally divided into several tortuous streams at low water,—their capacity being greatly disproportioned to the width of the bed, which offered an undue resistance to the flow and the ebb. There was great fall, and consequent rapid loss of height in the tidal column, which caused a considerable interval of rest between the currents of the flood and the ebb, during which period a great amount of deposit took place. Numerous other features, and their results, were carefully pointed out, and reasoned on.

The best means were then described for promoting the natural action of the tidal water, in rivers of good condition, so as to combine the most efficient drainage of the country with the best state of the navigable channel. The Mississippi was then given as an instance of the effect of a large volume of water, densely charged with alluvial matter, falling into the nearly tideless bay

of Mexico,—producing a delta of great extent, and so diminishing the depth of the harbours, as to prevent vessels of any considerable tonnage from frequenting the coast. This led to the enunciation of the axiom, that in the improvement of rivers of the second class, although the river walls might not be raised above the level of half tide, they would suffice to determine the future condition of the bed of the estuary, behind and parallel with them; as the conversion of those reclaimed spaces into land was simply a question of time and of the amount of alluvial deposit brought down by the floods. Thus, by this system, the same effect would be eventually produced, as by enclosing the space with full-tide walls,—it being impossible to keep open the rear space as receptacles for tidal water.

The tendency to deposit, in consequence of the formation of breakwaters, in certain situations, was fully considered, with the question of the difference between the relative times of high water, as affording a true test of the condition of a river: this latter view should be received with caution, as the only certain test was the condition or progress of the tidal wave throughout the entire period of the flow. Thus the tidal wave would pass more quickly through a broad and straight reach after the sands were covered, although its progress might have been very slow in the earlier stage of the tide, in consequence of the opposition of the sand-banks, which would form, for the nascent flow, a restricted and tortuous course, through a reach which, at high water, might appear well adapted for the ready transmission of the tidal column.

The author then described the broad principles of his own practice, in training the current of a river, to be based chiefly on the construction of full tide timber groynes or jetties at right angles to the intended new line of river frontage. These structures, raised at a cost of from twelve to thirty shillings per running foot, had been aptly designated by Sir W. Cubitt, "as the scaffolding for forming the new line of shore," and as "making so much more land, and bringing the shore to the form represented by a line drawn through the ends of the groynes." In practice it was found that, whilst the spaces between these groynes afforded a locality for the deposit of the alluvial soil, held in suspension, their action was also to produce a deepening of the main channel of the bed of the river at a much less cost than by the construction of parallel rubble walls. In fact, the latter should not be built until the groynes had completed their work, of raising the acquired land between them to the level of the bed on which the rubble walls were to be placed.

By adopting these means, there was scarcely a river whose navigable capacity might not be greatly increased, without any excessive outlay,—aiding at the same time the general drainage of the district, which, it was remarked, had been lamentably neglected in many of the schemes promulgated for the improvement of rivers.

November 16th.

The evening was entirely occupied by the discussion of Mr. W. A. Brooks' paper, "*On the improvement of tidal navigations and drainages.*"

It was contended, that the use of groynes was advisable, as a means for the regulation of the sectional area of the channel, which could only be accurately defined by practical experience. In some cases it would be better to combine them with training walls, on opposite sides of the river. It was considered, that two classes did not suffice to distinguish the differences existing between rivers, and that their several characteristics and circumstances must be minutely studied, to determine the mode of treatment. The Wye and the Avon were quoted as rapidly rising rivers, and yet being without bars at their mouths. To which it was replied, that those streams were not cases in point; that they were mere tributaries, whose mouths were traversed and swept clear by the rapid current of the Severn ; and that this latter river illustrated the position assumed, as there was a great loss of tidal range between Beachley and Framilode,—the channel wandering through a range of shoals.

The successful improvements executed at the entrance of Newhaven harbour, by Mr. Stevens, were alluded to.

The treatment of the Dee, by groynes, and the Clyde, by training-walls, was examined; and it was argued, that the inconveniences experienced in the former case, from the washing out of deep pools, at the points of the groynes, must be attributed to the injudicious extension of those structures, whence the navigation was too violently contracted,—the freshes flowing over them, and removing the deposit from between them. Rennie's Report on the Clyde, in 1807, shewed, that the irregularity of depth at the points of the groynes, previously erected by Golborne, was not anywhere 12 inches more than elsewhere in the channel. With reference to the wide expanse or "pouch" form of the Mersey, above Liverpool, which it was urged was of utility in scouring the bar on the ebb, it was contended, that the main body of water would pass off with the early ebb without producing any beneficial effect; and it was shewn that, in that part, the loss of tidal range was considerable, from the great expanse covered at high water, but which was shoal at low water.

The improvements of the Thames, by the removal of the shoals, and the construction of training-walls, were described, and it was suggested, that it might be beneficial to use groynes in the bays which had produced the shoals, now in course of removal.

Fully admitting the impossibility of generalizing, in river engineering, it was still urged, that there was more similarity between cases than was generally understood, and attention was directed to the inevitable effect arising from the conflicting action between the ebb and flood-tides at the mouths of rivers,

having a rapid rise of their low-water surface near their mouths, which invariably produced bars.

It was suggested, that the treatment of some special river should be submitted to the institution, in order to afford an opportunity for a continuation of the discussion of this interesting topic.

After the meeting, Mr. Doull, jun., exhibited a model of, and described a system, proposed by Mr. James Forbes, for lowering and raising ships' boats, and also the construction of a cylindrical ship-life-boat.

The cylindrical life-boat was 30 feet long, 8 feet wide, and 2 feet deep,—would carry with ease 60 persons, with provisions for a week in the air-tight seats,—could not be upset or swamped,—could be pulled either end foremost,—was steered with an oar,—had extra buoyancy in water-tight compartments, and was so constructed, that a hole might be knocked into one or more divisions, without danger to the whole,—was fully stowed with masts, sails, oars, and everything complete, so as to be always ready for use on any sudden emergency.

When folded up it was perfectly cylindrical; and on reaching the water it opened out, and could in a minute be made a stiff boat; and the dimensions could be modified to suit any vessel.

The apparatus for lowering the boats consisted of two davits with tubular stems, down which the ropes passed, through sockets in the bulwarks, to a drum, on which they were coiled, so as to be easily wound up by a wheel and pinion, with the exercise of very little power; and in lowering, a friction-break could be used with great advantage. By this means the boat would swing out very easily, as the davits could turn entirely round; and it would be nearly impossible that a boat could be swamped, in the heaviest sea, or under circumstances of the greatest difficulty. The cylindrical form, and its lightness of construction, would enable a boat of this sort to be put over the bulwarks by six men, without tackle of any kind; and by merely cutting a lashing when in the water, it would fall open,—when all the stores, &c., would be found made fast within, and ready for use.

November 23rd.

The paper read, was "*On the Drainage of Towns,*" by Mr. Robert Rawlinson, Assoc. Inst. C.E.

The author, believing the subject of the drainage of towns to be so comprehensive, that its full and complete consideration, within the limits of a paper, to be read in one evening, would be impossible, restricted his remarks to a few general points, likely to induce discussion and to elicit criticism, on former and present systems.

The historical portion was limited to shewing, that in the now disinterred ruins of the most ancient cities, remains of drains had been found, and the Cloaca Maxima formed part of the wonders of ancient Rome.

Politically, the question of sewerage was very urgent; as the general health of the population influenced, to an important extent, the amount of misery, pauperism, vice, and crime existing in every city; and the increasing numbers, as shewn by the census, demonstrated the necessity for providing for the extension of all large towns. In 1841, the population of one hundred and seventeen districts, comprising the chief towns, was 6,612,958 souls. In 1851, in the same districts, the number was 7,795,958. Disease had been rife in those districts; but it was shewn, that much of it might have been averted by timely sanitary precautions.

It was, however, to the social effect of town drainage, that the attention of civil engineers would be most naturally directed; as under that head the leading principles of actual practice and the proposed modifications must be brought forward and discussed.

The questions of forms, dimensions, fall, cost, &c., of large and small sewers, were passed over, with the remark, that they were matters of detail, to be fixed by the knowledge and experience of the engineer,—contending, however, that the system most deserving commendation was that which enabled the greatest extent of sewerage to be well and cheaply accomplished.

The position of the outlet would be governed by natural local conditions; and the dimensions would be fixed by the area and the number of houses to be drained.

The material of construction was a question dependent entirely on experience and practice: earthenware pipes were, however, according to the author's views, the most economical and effective for all sewers and drains, within the capacity of the material.

It was contended, that town sewers could not receive the excessive flood waters, even of the urban portion of the site;—they should never receive the suburban drainage, nor be combined with watercourses; they should be adapted solely to remove the solid and liquid refuse from the houses; and that it was safer for the inhabitants that there should be no sewers at all, rather than they should be of such dimensions as to become places of deposit. Pumping could be profitably adopted in certain situations, where, from the level, or the effect of tidal influence, the outlet flow might be checked. Intercepting sewers at mid-level were approved. Sewers of minimum dimensions were advocated, in connexion with pumping; and they should be capable of resisting internal hydraulic pressure, in case of the water rising in them.

The flow through sewers should be constant; and it was argued, this could only be secured by having small conduits.

The extraordinary fall of rain at Birmingham, in July, 1845, when nearly two inches of rain fell in half an hour, equivalent

to 9·091 gallons per square yard, or 44,000·440 gallons per acre, was used as an argument against the building of large sewers below the level of the cellars, which, to be of service, must be capable of carrying off the heaviest rain-fall.

It was contended, that the maximum surface water could not be passed through the sewers; but the natural surface outlet should be retained, to assist in carrying off the flood waters from the streets of large cities; though the fact of town sewers not having been originally intended to receive house drainage, or soil, was prominently noticed. The want of connexion between the houses and the sewers, in many parts of the metropolis, the absolute disconnexion at Paris, and the prohibitory law, only recently repealed, at Liverpool, being quoted.

With regard to earthenware pipes, 3 inches diameter was considered too small for any drain pipes, and 30 inches diameter too large for the material of which they were made.

Pipes of 4 inches diameter would probably be found the least sectional area that should be used for house drains, and 9 inches for streets, and then not at a less gradient than one in sixty. It was decided, that the beneficial use of pipe sewers could not be pushed beyond certain limits; but the system should not be entirely condemned because it had been carried to extremes by those who wanted experience.

The general success of the use of egg-shaped pipe sewers, at Manchester, was given as an example of the advantageous adoption of the pipe system.

The various kinds of joints were described, and it was recommended not to use pipes of larger diameter than about 15 inches, as larger sizes were apt to be fractured, from unequal bearing at the joints. The difficulty of moulding, drying, and burning pipes, increased, probably, as the squares of the diameters: if large pipes were moulded too thin, they were liable to be crushed in the finished sewer; and if they were moulded of extra strength, the wet pipes collapsed with their own weight in drying,—were twisted out of shape in burning,—or were imperfectly vitrified.

Sewers of radiated bricks, moulded for the purpose, were better and cheaper than large earthen pipes;—a sewer thus constructed, 3 feet in diameter, being cheaper than one of pottery pipe of 20 inches diameter; their relative capacities being as the squares of their diameters; and there was no reason why brick sewers should not be as smooth within, and as impervious as any pottery pipe.

After treating of side junctions, gulley-holes, drain-traps, and ventilation, the use of cast-iron conduits, in certain bad soils, was advocated; and as a summary, it was stated, that all sewers should be below the level of the cellars, and should be specially adapted to the work they had to perform. Rivers and natural streams should not form part of any system of town drainage; and, in low districts, the sewers should be capable of resisting internal pressure. Free outlets should be preserved, whether from intercepting

or low sewers;—all small drains should be circular, and large ones oval, or egg-shaped: the largest radius should be adopted, and there should be extra fall in the curves. All sewers and drains should be impervious to water, and should present even and smooth surfaces. The gradient of all large sewers in steep ground should be modified or interrupted, and the materials used should be such as would resist rapid wear and bursting: wherever it was practicable, the outlet should be very free; and in all cases complete ventilation must be provided for. All mention of cesspools was omitted; as no locality could be considered as properly drained, in which they were permitted to exist, except near the outlets, for ultimate use for agricultural purposes.

The true purpose of town sewerage must be considered as the removal, with the utmost rapidity, from the vicinity of dwelling-houses, and the sites of cities and towns, all the refuse, which being liable to decomposition, could be conveyed away in water; and the more perfectly this could be accomplished, the better would be the work, and the greater the credit due to the engineer.

LIST OF GRANTS OF PROVISIONAL PROTECTION UNDER THE NEW LAW.

Cases in which a full Specification has been deposited.

Frederick Richards Robinson, of Charlestown, in the State of Massachusetts, and United States of America, for an improvement in the gridiron or instrument for cooking steak or other articles by broiling.—October 20.

Halsey Draper Walcott, of Boston, in the State of Massachusetts, and United States of America, for a new and useful or improved mechanism or contrivance for cutting button-holes or slits in cloth or other material.—October 26.

Thomas Potts, of Birmingham, in the county of Warwick, tube maker, for improvements in the manufacture of hinges, and in the machinery for producing the same.—October 27.

George William Ley, of Grand Parade House, Brighton, in the county of Sussex, Gent., for a method of imitating carvings in wood.—November 3.

Marc Klotz, of No. 77, Rue Rambuteau, in the city of Paris, in France, merchant, for an improved process and apparatus to be employed in ornamenting fabrics, leather, paper, and other surfaces.—November 4.

William Thomas Henley, of St. John-street-road, London, electrical engineer, for certain improvements in electric telegraphs, and in the apparatus and instruments connected therewith.—November 9.

Richard Prosser, civil engineer, No. 18, Broad-street, Birmingham, in the county of Warwick, for improvements in making metal tubes.—November 11.

Richard Prosser, civil engineer, No. 18, Broad-street, Birmingham, in the county of Warwick, for improvements in rolling of metals.—November 11.

Richard Barnes, of Wigan, in the county of Lancaster, ironmonger and brass founder, for improvements in cocks or plugs for water or other fluids.—November 11.

Robert John Smith, of Islington, in the county of Middlesex, Gent., for certain improvements in machinery or apparatus for steering ships and other vessels.—November 13.

Cases in which a Provisional Specification has been deposited.

68. George Ellins, of the borough of Droitwich, in the county of Worcester, for an improved method and apparatus for preparing flax straw for dressing and cleaning.—[*Dated October* 1.]

147. Edwin Whele, of Shiffnal, in the county of Salop, engineer, for improvements in apparatus for burning candles, and in horological apparatus attached thereto.—[*Dated October 2nd.*]

174. Alexander Campbell Duncan, of Glasgow, calico printer, for improvements in the art or process of dyeing cotton or other textile fabrics, or cotton or other yarns, when printed or mordanted with the coloring matter of madder or of dyewoods, and in machinery or apparatus employed therein.—[*Dated October 2nd.*]

199. Edwin Bates, of No. 7, Great Portland-street, London, county of Middlesex, Gent., for certain improvements for deriving motive power from expansive fluids, and the better application and economy thereof, for propelling ships and other vessels in sea, river, and canal navigation; also in the shape and action of wind-sails; the use of water as a motive power for driving machines, mills, &c.; the construction of turbines, air and water-pumps, marine-pumps for emptying ships of bilge water, and other useful purposes.—[*Dated October 4th.*]

219. Arthur Richard Burr, of Halesowen, in the county of Worcester, engineer, for certain improvements in making gun and pistol-barrels, applicable to the manufacture of other kinds of tubes.—[*Dated October 5th.*]

248. James Bird, of No. 16, Orchard-street, Portman-square, in the county of Middlesex, Gent., for a new artificial manure.—[*Dated October 6th.*]

256. John Cronin Jeffcott, of No. 1, Anglesea-street, in the county of the City of Cork, agriculturist, for an invention for producing heat for generating steam, and applicable to and for other purposes for which this invention has not been hitherto used, under the name and title of "a heat-producer and steam-generator."—[*Dated October 6th.*]

344. Samuel Perkes, civil engineer, No. 1, Walbrook, City of London, for improvements in certain apparatuses and machines for the production and treatment of mineral and other substances; and part of which are applicable for other useful purposes. —[*Dated October 12th.*]

345. Samuel Perkes, civil engineer, No. 1, Walbrook, City of London, for certain improvements in navigable vessels and propellers.—[*Dated October 12th.*]

347. Auguste Edouard Loradoux Bellford, of No. 16, Castle-street, Holborn, patent agent, for improvements in sewing cloth and other materials.—[*Dated October 12th.*]

360. George Lloyd, of the parish of Budbrooke, in the county of Warwick, Doctor of Medicine, for an improvement or improvements in the manufacture of paper.

361. Joseph Pimlott Oates, of Lichfield, in the county of Stafford, surgeon, for an improved spring or improved springs for carriages.

362. William Tatham, of Rochdale, in the county of Lancaster, machine-maker, for an improved mode or improved modes of preventing accidents on railways.

363. John Carter, of Meltham, in the parish of Almondbury, in the county of York, spinner, for improvements in the manufacture of woven fabrics.

364. Matthew Smith, of Over Darwen, in the county of Lancaster, manager, for improvements in machinery for weaving and printing.

365. Edward Lloyd, of Dee Valley, near Corwen, Merionethshire, North Wales, engineer, for certain improvements in steam-engines; the whole or part of which improvements are applicable to other motive engines.

366. Joseph Nash, chemist, of No. 3, Thames-parade, Pimlico, in the county of Middlesex, for the treatment and refining of sugar.

367. Peter Armand Le Comte de Fontainemoreau, of No. 4, South-street, Finsbury, London, and No. 39, Rue de l'Eschiquier, Paris, patent agent, for the invention of a certain chemical combination for the silicatisation of calcareous matters.

368. William Walker Stephens, of Logiegreen, Canonmills, Edinburgh, in the county of Edinburgh, for the application of retorts in gas-ovens, or other ovens, to a process of improving iron, and converting iron into steel.

369. Thomas Suttie, of Greenock, in the county of Renfrew, North Britain, smith, for improvements in roasting apparatus.

370. Robert Pinkney, of No. 26, Long-acre, in the county of Middlesex, ink manufacturer, for improvements in cases for holding marking materials.

371. Walter McFarlane, of Glasgow, in the county of Lanark, North Britain, iron founder, for improvements in water-closets.

372. Richard Williams, of Machen, in the county of Monmouth, engineer, for an improvement or improvements in pumps or pumping.

373. Pierre Josephe Rousset Coquerelle, civil engineer, of Paris, in the republic of France, for the combination of certain chymical agents for the replacing of indigo and other blues, which preparation he calls "Rousset blue."

374. Christopher Hill, of the Great Western Railway, Swindon, in the county of Wilts, for improvements in the manufacture of lubricating matters.

375. Gerard Andrew Arney, of Mitcham, in the county of Surrey, gelatine manufacturer, for improvements in coating or enamelling pictures, prints, paper, and other surfaces.

376. Henry McFarlane, of Lawrence-lane, in the City of London, merchant, for improvements in constructing metal beams or girders.

377. Martyn John Roberts, of Woodbank, Gerrard's-cross, in the county of Bucks., Gent., for improvements in galvanic batteries, and in obtaining chemical products therefrom.

378. Preston Lumb, of Vauxhall, in the county of Surrey, engineer, for improvements in apparatus for cleansing coal.

379. John Henry Lee, of No. 31, Northampton-square, in the county of Middlesex, ornamental sawyer, for improvements in sawing.

The above bear date October 13th.

380. Alfred Augustus De Reginald Hely, of Cannon-row, Westminster, in the county of Middlesex, civil engineer, for an improved waiter or tray.

381. Thomas Brown, of the Ebbw Vale Iron Works, Monmouthshire, and John Cox, of the Patent Coke Works, St. Philips, Bristol, for certain improvements in the mode of heating retorts or ovens for the manufacture of gas and other distillatory products of coal.

383. Donald Grant, late of Her Majesty's Ordnance Department, of Luton-place, Greenwich, in the county of Kent, esquire, for improvements in the means of applying the heat derived from the combustion of gas.

384. Joseph Henry Tuck, of Pall-mall, in the county of Middlesex, engineer, for improvements in stuffing-boxes, and in packing to be used in stuffing-boxes, bearings, pistons, and valves.

385. Louis Rossi, of Regent-street, in the county of Middlesex, perfumer, for an improved manufacture of muffs, boas, tippets, and other like articles.

386. John Duncan, of Dundee, in the county of Forfar, North Britain, manufacturer, for improvements in the treatment or manufacture of textile materials.

387. Joseph Major, of No. 13, Elizabeth-place, Ball's Pond-road, near Kingsland-gate, in the parish of Saint Mary, Islington, in the county of Middlesex, for removing spavins, ringbones, curbs, splents and other unnatural ossifications and humours from horses: which invention he names "Major's celebrated British remedy."

388. Alsop Smith, of Westminster, in the county of Middlesex, for improvements in the manufacture of fire-wood.

389. James Webster, of Leicester, in the county of Leicester, engineer, for improvements in the construction of springs.

390. John Swindells, of Pollard-street, Manchester, Gent., and William Nicholson, of Manchester, Gent., for improvements in obtaining oxygen gas, and applying it in the manufacture of various acids and chorine, for oxydating metallic solutions, and for ageing and raising various colouring matters.

391. Eugéne André Boutarel, manufacturer, of Paris, in the French republic, for improvements in ornamenting or applying color to fabrics.

The above bear date October 14th.

392. Joseph Burch, of Crag Hall, near Macclesfield, in the county of Chester, carpet manufacturer, for certain improvements in baths and bathing.

393. Joseph Burch, of Crag Hall, near Macclesfield, in the county of Chester, carpet manufacturer, for certain improvements in building ships and vessels, for the purpose of saving lives and property in cases of shipwreck or fire at sea.

394. Robert Hawkins Nicholls, of Bedford, in the county of Bedford, Gent., for the invention for horse-hoeing land.

395. John Gedge, of No. 4, Wellington-street South, Strand, in the county of Middlesex, patent agent, for an improved stove or heating apparatus.

396. James Lochhead, of Kennington, in the county of Surrey, manufacturer, and Robert Passenger, of Union-street, Southwark, in the same county, merchant, for certain improvements in the manufacture of glass and other vitrified substances, and in ornamenting and annealing the same.

397. Henry Moseley, of Wandsworth, in the county of Surrey, for a machine to be driven by the pressure of a fluid, or to displace a fluid, or to measure it.

398. Hermann Turck, of Broad-street-buildings, in the City of London, merchant, for improvements in propelling vessels.

399. Joseph Hopkinson, the younger, of Huddersfield, in the county of York, engineer, for improvements in steam boilers.

400. Simon Pincoffs, of Manchester, in the county of Lancaster, manufacturing chemist, and Henry Edward Schunck, of Rochdale, in the county of Lancaster, doctor of philosophy, for

improvements in the treatment of madder and other plants of the same species, and of their products, for the purpose of obtaining dyeing materials.

401. William Edward Newton, of the Office for Patents, No. 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in washing and amalgamating gold and other metals.

402. John William Branford, of Green's-terrace, Rotherhithe, in the county of Surrey, Gent., for improvements in fire-escapes.

403. Jeremiah Driver, of Keighley, in the county of York, moulder, and John Wells, of Bradford, in the county of York, moulder, for improvements in moulding in sand and loam, for the casting of iron and other metals.

404. William Stevenson, of Preston, in the county of Lancaster, manager, for improvements in weft forks for power looms.

405. Allan Edwin Hewson, of Birmingham, in the county of Warwick, japanner, for certain improved modes or processes for making buttons, beads, and other ornaments of dress.

406. Andrew Blair, of Mary Hill, in the county of Lanark, North Britain, calico printer, for improvements in printing or ornamenting fabrics.

407. Charles Henry Waring, of Neath Abbey, in the county of Glamorgan, iron-master, for improvements in the cutting and working or quarrying of coal, stone, shale, clay, and other similar substances, and in machinery for that purpose.

408. William James Matthias and Thomas Bailey, of Clerkenwell, in the county of Middlesex, clock makers, for improvements in clocks and watches.

The above bear date October 15th.

409. Evan Leigh, of Manchester, in the county of Lancaster, cotton-spinner, for certain improvements in machinery or apparatus for carding cotton and other fibrous materials.

410. Lot Faulkner, of Cheadle, in the county of Chester, machinist, for certain improvements in the method of obtaining motive power.

411. Jerome Andre Drieu, of Manchester, in the county of Lancaster, machinist, for certain improvements in weaving cloth, to be employed in the manufacture of stays.

412. John Howard, of Bolton, in the county of Lancaster, engineer, for certain improvements in the construction of steam boilers or steam generators.

413. Charles Tiot Judkins, of Britannia Works, Manchester, in the county of Lancaster, for improvements in machinery or apparatus for sewing or stitching.

414. John Woods, of Rainhill, in the county of Lancaster, tool maker, for improvements in screw stocks.

415. William Beckett Johnson, of Manchester, in the county of Lancaster, manager for Messrs. Ormerod and Son, engineers and iron-founders, for improvements in stationary steam engines.

416. Isaac Atkin, of Basford, in the county of Nottingham, lace manufacturer, and Charles Gurling, of Radford, in the county of Nottingham, manufacturer, for an improved machine for the manufacture of looped fabrics.

417. Pierre Augustin Puis, of Paris, France, but now temporary of No. 4, South-street, Finsbury, in the county of Middlesex, Gent., for an improved chain or cable, and an apparatus employed therewith for certain applications.

418. John Henry Johnson, of No. 47, Lincoln's-inn-fields, in the county of Middlesex, and of Glasgow, North Britain, Gent., for improvements in the manufacture of sugar.

419. John Henry Johnson, of No. 47, Lincoln's-inn-fields, in the county of Middlesex, and of Glasgow, North Britain, Gent., for improvements in the manufacture and applications of hyposulphite and similar compounds of zinc.

420. John Oliver York, of Paris, engineer, for improvements in connecting and in fixing rails in railway chairs.

The above bear date October 16th.

421. Charles Reeves, junior, of Birmingham, in the county of Warwick, manufacturer, for an improvement or improvements in the manufacture of knives.

422. George Randfield Tovell, of Mistley, and John Mann, junior, Esq., Justice of the Peace, of Colchester, both in the county of Essex, for improvements in the construction of ships and other vessels.

423. Samuel Fletcher Cottam, of Manchester, in the county of Lancaster, machinist, for improvements in quarrying slate.

424. John Henry Johnson, of No. 47, Lincoln's-inn-fields, in the county of Middlesex, and of Glasgow, North Britain, Gent., for improvements in drying, and in the machinery or apparatus to be used therein.

427. Auguste Edouard Loradoux Bellford, patent agent, of No. 16, Castle-street, Holborn, for improvements in the manufacture of fuel; part of which improvements are applicable to the manufacture of gas and soda, and freeing metals from extraneous substances.

428. John Campbell, of Bowfield, in the county of Renfrew, North Britain, bleacher, for improvements in the treatment or finishing of textile fabrics and materials.

429. William Harcourt and Joseph Harcourt, of Birmingham, in the county of Warwick, brass founders, for certain improvements in the construction and manufacture of match-boxes.

430. Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of No. 166, Fleet-street, in the City of London, patent agents, for improvements in vices.

431. Henry Hughes and George Firmin, of Plough-road, Rotherhithe, in the county of Surrey, manufacturers, for improvements in the manufacture of lamp black, and in recovering from such manufacture a substance suitable for fuel.

432. Edwin Heywood, of Glasburn, in the county of York, foreman to Messrs. Bairstow, of Sutton-mills, Keighley, in the county of York, for improvements in looms.

433. John Lyons McLeod, of Marylebone, in the county of Middlesex, lieutenant in the Royal Navy, for improvements in giving a metallic coating to iron ships' bottoms and other surfaces. *The above bear date October, 18th.*

434. Thomas William Greathead, of Dyer's-buildings, Holborn, in the City of London, lithographer, James Hilliard, of Cowcross, tobacco-pipe maker, and John George Reynolds, of No. 10, wharf, City-basin, City-road, clay merchant, both in the county of Middlesex, for improved means of heating, cooking, and warming.

435. John Goodman, of Hazel-grove, in the county of Chester, Doctor of Medicine, for an improved fountain pen.

436. Robert Mole, of Birmingham, in the county of Warwick, manufacturer, and Robert Mole, jun., of Birmingham, aforesaid, manufacturer, for improvements in the manufacture of swords and matchets.

437. Arthur James, of Redditch, in the county of Worcester, manufacturer, for an improvement or improvements in needle cases or wrappers.

438. Joseph Harcourt and William Harcourt, of Birmingham, in the county of Warwick, brass-founders, for the application of porcelain, glass, or earthenware to articles in which, or for which, those materials have never heretofore been used.

439. Martin Walter O'Byrne and John Dowling, both of No. 17, Burr-street, in the county of Middlesex, machinists, for a machine for cutting paper, mill-board, leather, vellum, sheet-metals, and other suitable materials, for useful and ornamental purposes.

440. Fennell Herbert Allman, civil and consulting engineer, of No. 16, Westbourne-street, Hyde-park, in the county of Middlesex, for certain improvements in the manufacture and construction of brushes.

441. John Kealey, of Oxford-street, in the county of Middlesex, agricultural implement maker, for improvements in machinery or apparatus for cutting or slicing roots.

442. William Newton, of the office for patents, No. 66, Chancery-

lane, in the county of Middlesex, civil engineer, for an improved machine for separating ores, metals, and other heavy substances, from mud, sand, gravel, stones, and other impurities.

443. William Chisholm, of Holloway, in the county of Middlesex, chemist, for improvements in obtaining caustic soda and other substances from the residues of articles used in the purification of gas.

444. Gabriel Benda, of Basinghall-street, in the City of London, merchant, for improvements in apparatus for obtaining fire for smokers.

445. George Gotch, mechanist, of King's-street-terrace, Islington, in the county of Middlesex, for certain improvements in transmitting intelligence upon railways.

446. Robert Bird, of Crewkerne, in the county of Somerset, for improvements in the straining webs of saddles.

447. George Gadd, of Fisher-gate, in the town and county of the town of Nottingham, engineer, for improvements in apparatus for roasting coffee.

448. James Otams, of No. 2, Horton-villas, Camden-road, Holloway, in the county of Middlesex, Gent., for improvements in the manufacture of manure.

449. John Jones, of Sheffield, in the county of York, manufacturer, for improvements in handles for knives, razors, and other like instruments.

The above bear date October 19th.

450. George Heyes, of Blackburn, in the county of Lancaster, for improvements in the manufacture of fancy woven or textile fabrics, and in the machinery or apparatus connected therewith.

451. Robert Brown, of Manchester, in the county of Lancaster, Gent., for certain improvements in the method of ventilating buildings or apartments, and in the apparatus connected therewith.

452. John Carnaby, of No. 130, St. John-street, Clerkenwell, in the county of Middlesex, Gent., for apparatus for turning, managing, and regulating the main taps of gas pipes laid on to houses or buildings, at a part of the house or building distant from the main tap.

454. Charles Clarke, of No. 43, Preston-street, Brighton, in the county of Sussex, engineer, and John Gilbert, of No. 10, Hyde-place, Hoxton, in the county of Middlesex, plumber, for improvements in the supply and distribution of water and other fluids.

455. Auguste Edouard Loradoux Bellford, of No. 16, Castle-street, Holborn, in the City of London, patent agent, for improvements in cocks or taps.

456. Anthony Liddell, of Canterbury, in the county of Kent, engineer, for improvements in stuffing-boxes and in packing to be employed with stuffing-boxes and pistons.

457. Auguste Edouard Loradoux Bellford, of No. 16, Castle-street, Holborn, in the City of London, patent agent, for a new mechanism to reverse the motion of steam engines, particularly of locomotives.

458. Peter Evans Donaldson, of Shrewsbury, in the county of Salop, engineer, for improvements in dams, locks, and lock-gates.

459. Charles Weightman Harrison and Joseph John Harrison, both of Richmond, in the county of Surrey, engineers, for improvements in protecting insulated telegraphic wires.

460. Gustave Paul de Lhuynes, of Conduit-street, Hanover-square, in the county of Middlesex, Doctor of Medicine, for improvements in apparatus for public announcements or advertisements.

461. Thomas Henry Biddles, of Mansfield-road, in the town and county of the town of Nottingham, lace manufacturer, and John William Duphrate, of Radford, in the county of Nottingham, mechanic, for improvements in machinery for the manufacture of textile and looped fabrics.

462. Jacob Tilton Slade, of Pall-mall, in the county of Middlesex, Gent., for the invention of an improved hoisting apparatus.

463. William Harrison, of Blackburn, in the county of Lancaster, machinist, for certain improvements in machinery or apparatus for sizing, and otherwise preparing cotton, wool, flax, and other warps for weaving.

464. John Gilbert, of 79, Wardour-street, and Samuel Nye, of the same place, in the county of Middlesex, for improvements in mincing meat and other substances.

465. Joseph Cundy, of No. 21, Victoria-grove, Kensington, in the county of Middlesex, for improvements in hot-air stoves.

466. Robert Burns, of Liverpool, in the county of Lancaster, engineer, and Richard Pritchard Willett, of the same place, bone-merchant, for certain improvements in machinery or apparatus for cutting bones.

The above bear date October 20th.

467. John Smith, of Bilston, in the county of Stafford, brass-founder, for a machine for the cultivation or cleaning of land, and for digging potatoes or other roots.

468. Alexander Thomas, of Peckham, in the county of Surrey, engineer, for certain improvements in the treatment and welding of metals by certain chemical combinations.

469. Robert Hoppen, of Plymouth, in the county of Devon,

a master in Her Majesty's Navy, for improvements in apparatus for mincing meat.

470. William Lukyn the elder, of Broad-street, in the city of Nottingham, dentist, for the invention of a liquid draught detector, or self-measuring tube, with a union conveyance tap and its stock and time-table.

471. John Provis, of Chippenham, in the county of Wilts, Gent., for improvements in the construction of ships or vessels.

472. Joseph Rose, foreman and manager to John Leadbeater, of Aldersgate-street, in the City of London, lock manufacturer, for improvements in locks.

473. Julian Bernard, of Guildford-street, Russell-square, in the county of Middlesex, Gent., for improvements in the production of ornamental surfaces upon leather.

474. William Weild, of Manchester, in the county of Lancaster, engineer, for improvements in looms for weaving certain descriptions of pile fabrics.

475. John Currie, of Glasgow, in the county of Lanark, North Britain, miller, for improvements in grinding wheat and other substances, and in the treatment and preparation of such substances and the products thereof.

476. Samuel Marsh, of Mansfield, in the county of Nottingham, for improvements in the manufacture of woven fabrics by means of lace machinery.

477. Henry Charles Gover, of No. 9, Princes-street, Bedford-row, in the county of Middlesex, for improvements in the apparatus used in printing with colors.

478. Robert Chalker, of No. 6, John-street, Adelphi, in the county of Middlesex, for improvements in the manufacture of manure.

479. William Addison, of No. 5, Catherine-terrace, Old Ford, in the county of Middlesex, for improvements in constructing and propelling vessels.

480. John Fowler, of Temple-gate, Bristol, in the county of Somerset, for improvements in machinery for draining land.

481. John Fowler, of Temple-gate, Bristol, in the county of Somerset, for improvements in laying wires for electric telegraphs.

482. John Fowler, of Temple-gate, Bristol, in the county of Somerset, for improvements in reaping machinery.

483. John Fowler, of Temple-gate, Bristol, in the county of Somerset, for improvements in machinery for sowing seed and depositing manure.

The above bear date October 21st.

484 George Ellins, of the borough of Droitwich, in the county of

Worcester, for an improved method and apparatus for dressing and cleaning flax straw.

485. Jean Marie Souchon, of Paris, in France, chemist, for improvements in the manufacture and purification of gas for illumination, and certain products therefrom, and in apparatus for that purpose.

486. Julien Boilesve, of No. 4, North-terrace, Brompton, engineer, for an improved mode of preserving vegetable substances and animal coatings.

487. Archibald Slate, of Dudley, in the county of Worcester, civil engineer, for certain improvements in the manufacture and construction of cores and core bars, used in the production of hollow castings in iron and other metals.

488. Juliana Martin, of Soho-square, London, for an improved apparatus for artificial hatching.

489. Peter Armand Le Comte de Fontainemoreau, of the English and Foreign Patent Office, No. 4, South-street, Finsbury, in the county of Middlesex, for improvements in apparatus for *essaying* silk, cotton, and other similar fibrous substances.

490. Stanislaus Hoga, of Nassau-street, in the county of Middlesex, Gent., for improvements in separating gold from the ore.

491. James Wilson, of No. 37, Walbrook, in the City of London, for improvements in printing fabrics of silk or partly of silk.

The above bear date October 22nd.

492. John Holmes, of Manchester, in the county of Lancaster, engineer and machinist, for improvements in lathes.

493. George Price, of Birmingham, stove manufacturer, for a new or improved gas stove.

494. Philip Berry, of Manchester, in the county of Lancaster, machine-maker, for certain improvements in machinery or apparatus for manufacturing bolts and nuts, and other similar articles in metal.

495. David Crichton, of Manchester, in the county of Lancaster, machinist, for arrangements and apparatus for producing continuous circular motion, giving a series of different velocities obtained from alternate motions, applicable to looms and other machines.

496. Thomas Fothergill, of Manchester, in the county of Lancaster, cotton-spinner, and Alexander Cummings Harvey, of the same place, cotton-spinner, for certain improvements in the treatment of cotton-wool, and in the manufacture of colored yarns or threads therefrom.

497. Louis Napoleon Legras, of Wenlock-street, Hoxton, in the county of Middlesex, Gent., civil engineer, and William Law-

rence Gilpin, of Bayswater, in the county of Middlesex, civil engineer, for improvements in the generation of electricity.

498. George Malcolm, of the firm of Malcolm, Ogilvie, and Co., of Dundee, in the county of Forfar, Scotland, manufacturers, for certain improvements in the process of carding or teasing jute and other fibrous substances.

499. James Brodie, clerk, of Bow of Fife, in the county of Fife, North Britain, for certain improvements in the construction of sea-going vessels.

500. Arnold James Cooley of Parliament-street, in the City of Westminster, consulting chemist, for improvements in the manufacture of artificial leather.

501. Louis Napoleon Legras, of Wenlock-street, Hoxton, in the county of Middlesex, Gent., civil engineer, and William Lawrence Gilpin, of Bayswater, in the county of Middlesex, civil engineer, for improvements in treating flax, hemp, and other fibrous substances.

502. Charles William Graham, of Bishopsgate-street within, in the City of London, merchant, for improvements in the manufacture of bottles and jars.

503. Albert Hiscock, of Tichbourne-street, Haymarket, in the county of Middlesex, laceman, for the application of ornamental printing to certain fabrics, which have hitherto not been printed upon.

504. George Kennedy Geyelin, of Camden Town, London, for an improved machine for grinding pigments or other vegetable or mineral substances.

505. William Macbay, of Woolwich, in the county of Kent, for improvements in extinguishing fire in dwellings, factories, and other buildings, and in ships.

506. Robert Mudge Marchant, of Pimlico, in the county of Middlesex, civil engineer, for improvements in the construction of bridges.

507. Felix Lieven Bauwens, of Croydon, in the county of Surrey, chemist and manufacturer, for improvements in treating fatty matters prior to their being manufactured into candles and mortars, which are also applicable to oils.

508. William White, of the firm of William White and Son, of Cheapside, in the City of London, hat manufacturers, for an improved fabric, suitable for ventilating hat bodies.

509. Charles Watson, of No. 31, Rhodes-street, Halifax, in the county of York, for improvements in ventilation.

510. John Tayler, of Manchester, in the county of Lancaster, engineer, and James Slater, of the same place, Gent., for certain improvements in machinery, apparatus, or implements for weaving.

The above bear date October 23rd.

511. John Hunter, formerly of Boston, United States of America, now of Liverpool, in the county of Lancaster, telegraphic agent, for improvements in electric telegraphs, and in apparatus connected therewith.

512. John James Stoll, of the Palace, Enfield, in the county of Middlesex, for improvements in the manufacture of boots and shoes, and similar articles, and in machinery used therein, entitled metallic toothed and wedged seams and waterproof elastic indented stitches.

513. Samuel Plimsoll, of Sheaf Gardens, in the parish of Sheffield, in the West Riding of the county of York, office clerk, for the more thoroughly and effectually cleansing, extracting, and separating, or fining ale, beer, porter, bitter beer, India pale ale, and other malt liquors from the yeast, bottoms, barm, sediment, and other extraneous matters and impurities with which it may be in combination.

514. Charles Leon Desbordes, of Paris, in France, engineer, for improvements in instruments for measuring the pressure and temperature of air, steam, and other fluids.

515. Robert William Mitcheson, of the firm of William Mitcheson and Sons, of Garford-street, in the county of Middlesex, anchor-smiths, for improvements in anchors.

516. Arthur Wall, of Poplar, in the county of Middlesex, for improvements in the manufacture of sulphuric and other acids.

517. Joseph Florentin Anacharsis Debray, of Paris, in the republic of France, for an improved stock or neckcloth.

518. William Johnson, of No. 47, Lincolns-inn-fields, in the county of Middlesex, and of Glasgow, North Britain, civil en-engineer, for improvements in the manufacture of spikes or metal pins.

519. Mathew Fitzpatrick, of Upper Cleveland-street, Fitzroy-square, in the county of Middlesex, machinist, for certain improvements in machinery or apparatus to be applied to locomotive engines and carriages for the prevention of accidents; and also in the manufacture and application of indestructible and non-rebounding cushions, to be applied to the above, and for other similar purposes.

The above bear date October 25th.

520. Claude Mamés Augustin Marion, of Paris, in the republic France, now residing in Regent-street, in the county of Middlesex, for a new kind of damper for moistening stamps and paper.

521. John Cass, of Blue Pits, near Rochdale, in the county of Lancaster, engineer and millwright, for improvements in steam-engines.

522. William Smith and John Smith, both of No. 5, Upper John-

street, Golden-square, in the county of Middlesex, for certain improvements in garments or articles of dress.

523. William Clarke, of Manchester, in the county of Lancaster, engineer, for improvements in joints for connecting metals.

524. Charles Rowley, of Birmingham, in the county of Warwick, button manufacturer, for certain improvements in nails.

525. Myer Myers and Maurice Myers, trading as the firm of Myers and Son, and William Hill, manager to the said firm, steel pen manufacturers, all of Birmingham, in the county of Warwick, for certain improvements in pens and penholders.

526. James Nasmyth, of Stafford-street, Bond-street, in the county of Middlesex, engineer, for an improved mode of utilizing running waters.

527. Joseph Charles Frederick Baron de Kleinsorgen, of Little New-street, in the City of London, for an improved apparatus for indicating the variation of the magnetic needle.

529. Robert William Mitcheson, of the firm of Mitcheson and Sons, of Garford-street, in the county of Middlesex, anchor smiths, for an improved safety hook.

530. Henry Page, of Whitechapel-road, in the county of Middlesex, paper-stainer, for improvements in paper-staining.

The above bear date October 26th.

531. George Evans, of Marylebone, in the county of Middlesex, Gent., for improvements in treating peat and other carbonaceous matters.

532. John Lee Stevens, of Kennington, in the county of Surrey, for improvements in furnaces.

533. Anthony Fothergill Bainbridge, of Putney, in the county of Surrey, for improvements in the manufacture of artificial flies and other bait for fish.

534. Samuel Clarke, of No. 55, Albany-street, Regent's-park, in the county of Middlesex, lamp and candle manufacturer, for improvements in the manufacture of candles.

535. James Conry, of Manchester, in the county of Lancaster, umbrella and parasol manufacturer, for improvements in umbrellas and parasols.

536. James Crosby, of Manchester, in the county of Lancaster, merchant, for improvements in looms.

537. William Robert Bertolacci, of No. 45, Rue d'Amsterdam, Paris, in the republic of France, for an improved pneumatic ink and pen holder.

538. Alfred Charles Hervier, civil engineer, of Paris, in the republic of France, and No. 4, South-street, Finsbury, London, for an improvement in the application of centrifugal force to propelling on water.

539. Louis Napoleon Legras, of Wenlock-street, Hoxton, in the county of Middlesex, civil engineer, and William Lawrence Gilpin, of Bayswater, in the county of Middlesex, civil engineer, for a compound having the properties of gutta-percha.

541. Thomas Wilks Lord, of Leeds, in the county of York, flax and tow machine maker, for improvements in safety and other lamps.

542. Henry Carr, of East Retford, in the county of Nottingham, civil engineer, for certain improvements in railways.

543. John Norton, of Cork, in the county of Cork, Esq., Captain, late of H.M. 34th Foot, for improvements in blasting.

544. James Hadden Young, of No. 66, College-street, Camden Town, in the county of Middlesex, for improvements in expressing juice or fluid from the sugar cane, and from other matters.

545. Charles Benjamin Normand, of Havre, in the republic of France, ship-builder, for improvements in machinery for sawing wood.

546. James Nasmyth, of Stafford-street, Bond-street, in the county of Middlesex, engineer, for improvements in the mode of obtaining and applying motive power.

547. James Henry Smith, of Connaught-terrace, London, for improvements in corsets.

The above bear date October 27th.

548. William Thorp, dyer, bleacher, and finisher, of Collyhurst, near Manchester, in the county of Lancaster, for certain improvements in steam-boxes, and the mode of heating press-plates used in hot-pressing of silks, de-laines, cobourgs, merinos, fancy goods, and other similar fabrics.

549. Bryan Donkin the younger, of Bermondsey, in the county of Surrey, engineer, and Barnard William Farey, of Commercial-road, Old Kent-road, in the said county, engineer, for improvements in the machinery for measuring or marking off long lengths or continuous webs of paper or other materials in to any required lengths, for the purpose of being cut or otherwise disposed of.

550. John Wormald, of Manchester, in the county of Lancaster, maker-up and packer, for improvements in machinery or apparatus for roving, spinning, and doubling cotton, wool, or other fibrous substances.

551. Henry Provost, of Paris, in the republic of France, manufacturer, for an improved hat protector.

552. George Hattersley, of Sheffield, in the county of York, for a radiating hearth plate.

553. Charles Frederick Bielefeld, of the Strand, in the county of Middlesex, for improvements in billiard and bagatelle tables.

554. John Collis Browne, assistant-surgeon to the forces at Fort Pitt, Chatham, in the county of Kent, for an invention for the relief of individuals suffering from pulmonary affections or diseases of the chest.

555. Thomas Parker Tabberer, of Derby, for improvements in machinery for frame-work knitting.

556. Charles Arthur Redl, of No. 27a, Davis-street, Berkeley-square, in the county of Middlesex, for improvements in telegraphing or communicating signals at sea and otherwise.

557. Robert Mallet, of the city of Dublin, in Ireland, engineer, for improvements in fire-proof and other buildings and structures.

The above bear date October 28th.

558. Henry Robert Ramsbotham, of Bradford, in the county of York, worsted-spinner, and William Brown, of the same place, mechanic, for improvements in preparing and combing wool and other fibrous substances.

559. Charles Auguste Joubert, of Paris, in France, merchant, Léon Jacques Tricas, also of Paris, merchant, and Jules César Kohler, also of Paris, engineer, for improved busks for stays.

560. Arthur Ashpitel and John Whichcord the younger, both of Carlton Chambers, Regent-street, in the city of Westminster, in the county of Middlesex, architects, for certain improvements in cocks, valves, and fire-plugs.

561. James Godfrey Wilson, of Lindsey-house, Chelsea, in the county of Middlesex, civil engineer, for improvements in signals to be used on railways, or for similar purposes, and in the apparatus connected therewith.

562. Arnold James Cooley, of Parliament-street, in the city of Westminster, consulting chemist, for improvements in treating woven and felted fabrics, to render the same repellant to water and damp.

563. George Bower, of St. Neot's, in the county of Huntingdon, ironmonger and ironfounder, for improvements in gas-stoves or fire-places.

564. William Bates, of Leicester, in the county of Leicester, fuller and dresser, for improvements in apparatus for getting-up stockings and other hosiery goods.

565. William Henry Fox Talbot, of Lacock Abbey, in the county of Wilts, Esq., for improvements in the art of engraving.

566. Louis Napoleon Le Gras, of Wenlock-street, City-road, in the county of Middlesex, civil engineer, and William Lawrence Gilpin, of Porchester-terrace, Bayswater, in the said county, Gent., for improvements in transmitting electric currents.

567. Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of No. 166, Fleet-street, in the City of London, patent agents, for improvements in violins and other similar stringed musical instruments.

568. Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of No. 166, Fleet-street, in the City of London, patent agents, for improvements in tackle blocks.

The above bear date October 29th.

569. William Binns, of No. 43, Trinity-square, in the borough of Southwark, in the county of Surrey, consulting engineer, for an improved mode of constructing a draught breast-plate or collar for horses or other draught animals.

570. Martin Watts, of Patricroft, near Manchester, in the county of Lancaster, cotton spinner, for certain improvements in machinery or apparatus for roving or preparing cotton and other fibrous substances for spinning.

571. Thomas Sanders Bale, of Cauldon-place, in the county of Stafford, china manufacturer, and Frederick George Sanders, of the same place, engineer, for certain improvements in machinery or apparatus for grinding and mixing clays, or other plastic materials.

573. Edward Bird, of Birmingham, Gent., and Edward Welch, of London, architect, for an improved cart or vehicle.

574. John Gedge, of No. 4, Wellington-street, Strand, in the county of Middlesex, patent agent, for improvements in printing-presses or machines.

575. Pierre Bernardet de Lucenay, of Paris, in the republic of of France, and of No. 4, South-street, Finsbury, London, for the production of photographic images by means of artificial light.

576. Bowman Fleming McCallum, of Govon Croft Dye Work, Glasgow, in the county of Lanark, dyer, for a yarn-drying machine.

577. John Crowther, of Huddersfield, contractor, and William Teale, of Wakefield, engineer, for improvements in obtaining motive power.

578. Edmund Adolphus Kirby, of Haverstock Hill, surgeon, for an improved adjusting-couch for medical, surgical, and general purposes.

579. Alfred Vincent Newton, of the Office for Patents, No. 66, Chancery-lane, in the county of Middlesex, mechanical-draughtsman, for improvements in machinery for cutting corn and other standing crops.

580. Jean Auguste Lebrun, of Paris, but now residing at Panton-square, in the county of Middlesex, civil engineer, for im-

provements in the construction of buildings and pavements, and the manufacture of the materials used therein.

581. Julian Bernard, of Guildford-street, Russell-square, in the county of Middlesex, Gent., for improvements in the manufacture of glass.

582. James Sinclair, of Stirling, in the county of Stirling, North Britain, for improvements in engines to be worked by steam, air, or water,—the said improvements being also applicable to pumps.

583. Richard Archibald Brooman, of the firm of J. C. Robertson and Co., of No. 166, Fleet-street, in the City of London, patent agents, for improvements in revolving fire-arms.

584. George Thomas Selby, of Smethwick Tube Works, Birmingham, in the county of Warwick, engineer, for improvements in steam-boilers.

585. John Whitcomb and Richard Smith, both of Kidderminster, foremen, for improvements in the manufacture of carpets, hearth-rugs, and other similar fabrics.

586. George Thomas Selby, of Smethwick Tube Works, Birmingham, in the county of Warwick, engineer, for improvements in machinery for the manufacture of tubes and pipes.

587. James Rock, the younger, of Hastings, carriage-builder, for improvements in railway carriages.

588. George Fergusson Wilson, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, and Edward Partridge, of Wandsworth, Gent., for improvements in the instruments of apparatus used when burning candles.

589. William Dantec, of Liverpool, in the county of Lancaster, for improvements in preventing incrustation in steam-boilers.

The above bear date October 30*th.*

590. William Petrie, of Woolwich, in the county of Kent, civil engineer, for improvements in the manufacture of sulphuric acid.

591. George Evans, of Wellington, in the county of Shropshire, Gent., for an improved gridiron.

592. George Dixon, of the city of Dublin, soap and candle manufacturer, for an improvement in bleaching palm oil.

593. Edward Lawson, machine maker, of Leeds, in the county of York, for certain improvements in machinery for preparing to be spun, hemp, flax, tow, wool, silk, cotton, and other fibrous materials.

594. Charles John Berkeley, of Smethwick, in the county of Stafford, glass manufacturer, for a new or improved reflector, or new or improved reflectors, for illuminating purposes.

595. Joseph John William Watson, of Old Kent-road, in the county of Surrey, and Thomas Slater, of the parish of St.

Pancras, in the county of Middlesex, for improvements in galvanic batteries, and in the application of electric currents to the production of electrical illumination and of heat, and in the production of chemical products by the aforesaid improvements in galvanic batteries.

596. Joseph Dunning, of the Parthenon-chambers, No. 14, Regent-street, in the parish of St. James, in the City of Westminster, surveyor, for an improvement in the construction of coke ovens.

597. Henry Walker, of Gresham-street West, in the City of London, needle manufacturer, for improvements in machinery and apparatus used in cylinder-printing.

598. Henry Brock Billows, of the Curtain-road, London, for improvements in the construction of gas-burners for illuminating and heating purposes.

599. Julius Smith, of Islington, in the county of Middlesex, Gent., for certain improvements in apparatus to be used in ships and steamers for ascertaining and signalling depths at sea.

600. George Fergusson Wilson, of Belmont, Vauxhall, in the county of Surrey, managing director of Price's Patent Candle Company, for improvements in the manufacture and treatment of oils.

601. Julius Jeffreys, of Croydon, in the county of Surrey, for improvements in obtaining power when steam or other vapour is used.

602. John Chubb, of Saint Paul's Churchyard, in the City of London, for improvements in locks.

603. David Thomson, of Dundee, in the county of Forfar, manufacturer, for improvements in the manufacture of carpets.

604. Paul Jerrard, of No. 111, Fleet-street, in the City of London, publisher, for certain improvements in ornamenting japanned and papier-maché surfaces, as also the surfaces of varnished and polished woods.

605. George Stenson, of the town and county of Northampton, engineer, for improvements in apparatus for separating gold from auriferous sand and earth.

606. John Jacques the younger, of Hatton-garden, in the county of Middlesex, ivory turner, for improvements in chess and and draught boards.

607. Francis Daniell, of Camborne, in the county of Cornwall, analytical chemist, for improvements in stamp-heads.

The above bear date November 1st.

608. Jerome André Drieu, of Manchester, in the county of Lancaster, machinist, for improvements in machinery for weaving and for dividing double cloth to make pile fabrics.

609. John Nicholas Marion, Gent., of Paris, in the republic of France, and of No. 4, South-street, Finsbury, in the county of Middlesex, for a new mode of rendering concrete coleseed oil.

610. William Edward Newton, of the Office of Patents, No. 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the manufacture of capsules or covers for bottles and other hollow articles.

611. Robert William Sievier, of Holloway, in the county of Middlesex, Gent., for improvements applicable to the manufacture of hats, caps, and bonnets, or other coverings for the head.

612. James Dible, of Northam, in the county of Hants, shipwright, for improvements in ventilating and heating ships; which improvements are also applicable to extinguishing fire on board ship.

614. Charles Dickson Archibald, of Rusland Hall, Milnthorpe, in the county of Westmoreland, Esq., for improvements in machinery and apparatus for crushing, grinding, and triturating refractory and other materials, and for washing and separating ores and metals from earthy and other substances.

615. Charles Dickson Archibald, of Rusland Hall, Milnthorpe, in the county of Westmoreland, Esq., for improvements in lighting and heating.

616. Louis Auguste Pouget, of Paris, in the French Republic, manufacturer, for improvements in lamps.

617. John Macintosh, of Aberdeen, for improvements in the manufacture of paper.

618. Georges Hyacinthe Ozouf, of Paris, in the French Republic, manufacturer, for certain improvements in working, forming or shaping sheet metal and alloys.

619. George Fergusson Wilson, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, for improvements in the preparation of materials for, and in the manufacture of candles and night lights.

620. George Fergusson Wilson, of Belmont, Vauxhall, managing director of Price's Patent Candle Company, for improvements in treating wool in the manufacture of woollen and other fabrics.

621. Bernhard Samuelson, of Banbury, in the county of Oxford, for improvements in breaking up and tilling land.

The above bear date November 2nd.

622. George William Ley, of Grand Parade House, Brighton, in the county of Sussex, Gent., for the manufacture of a material to be used for certain purposes instead of wood, leather, millboard, or oil-cloth.

624. Edward Lord, of Todmorden, in the county of York,

machine maker, for improvements in certain machinery to be used in preparing, spinning, and weaving cotton and other fibrous substances.

625. John Cameron, of Manchester, in the county of Lancaster, mechanic, for improvements in boilers for generating steam, and in feed pumps and apparatus connected therewith.

626. Charles Phillips, of the city and county of Bristol, engineer, for improvements in apparatus or machinery for reaping or cutting crops of corn, or other crops to the cutting of which reaping machines are applicable.

627. Alfred Augustus De Reginald Hely, of Cannon-row, Westminster, in the county of Middlesex, civil engineer, for an improved shade or chimney for lamps, chandeliers, gas and other burners.

628. Alfred Sidebottom, of Downham-road, Islington, in the county of Middlesex, civil engineer, for improvements in machinery or apparatus for cutting books, paper, and other substances.

629. Auguste Alexandre Tiesset, of Boulogne-sur-Mer, in the republic of France, merchant, for improvements in apparatus for exhibiting notices and advertisements of various kinds.

630. Henry Spencer, of Rochdale, in the county of Lancaster, manager, and Edmund Taylor, of the same place, engineer, for improvements in steam engines and boilers.

631. Harrison Blair, of Colthurst, in the parish of Mitten, and county of York, for improvements in apparatus for supplying steam boilers with water.

632. Nehemiah Hodge, of North Adams, in the state of Massachusetts and United States of America, for discharging water from the hold of a navigable vessel.

633. John Macintosh, of Berners-street, in the county of Middlesex, for improvements in projectiles and cartridges.

The above bear date November 3rd.

634. Emily Pettit, of No. 10, Brompton-crescent, Brompton, in the county of Middlesex, spinster, for a musical instrument, which she calls a "Euphotine."

635. Charles Pryse and Richard Redman, both of Birmingham, in the county of Warwick, gun makers, for improvements in a certain description of fire-arms.

636. Elisha Thomas Archer, of Oxford-street, in the county of Middlesex, paper stainer, for improvements in the manufacture of coverings for walls.

637. William Pope, of Holford-square, Pentonville, in the county of Middlesex, engraver, for improvements in the ventilation of ships.

638. Augustus Brackenbury, of No. 49, Henry-street, Saint John's Wood, Paddington, in the county of Middlesex, for precipitating the muriate of soda more economically than the process now adopted.

639. Joseph Reynaud, of Paris, in the republic of France, for certain improved means of imitating marbles and various coloured woods:

The above bear date November 4th.

641. Collinson Hall, of Essex, farmer, for an apparatus to be used in the carriage of solid and liquid bodies.

642. James Pilbrow, of Tottenham, in the county of Middlesex, civil engineer, for certain improvements in obtaining motive power.

643. Joseph Bunnett, of Deptford, in the county of Kent, engineer, for improvements in revolving iron or other metal shutters.

644. George Shand, of Glasgow, in the county of Lanark, and Andrew M'Lean, of Edinburgh, in the county of Mid Lothian, Scotland, chemists, for improvements in obtaining products from tar.

645. Peter Fairbairn, of Leeds, in the county of York, machinist, for certain improvements in self-acting reeling machinery for reeling flax and other yarns into hanks.

646. George Fife, of the town and county of Newcastle-upon-Tyne, Doctor of Medicine, for improvements in steam and water gauges.

647. John Henderson Porter, of Birmingham, in the county of Warwick, engineer, for improvements in the construction of portable buildings and other structures.

648. John Frame, of Glasgow, in the county of Lanark, North Britain, engineer, for improvements in looms for weaving.

649. Andrew Lawson Knox, of Glasgow, in the county of Lanark, North Britain, manufacturer, for improvements in the manufacture or production of ornamental fabrics.

650. James Wotherspoon, of Glasgow, in the county of Lanark, North Britain, wholesale confectioner, for improvements in the manufacture or production of confectionary, and in the machinery, apparatus, or means employed therein.

651. Hesketh Hughes and William Thomas Denham, both of Cottage-place, City-road, in the county of Middlesex, manufacturers of fancy trimmings, for certain machinery for the manufacture of fancy ribbons, ornamental trimmings, chenilles, fringes, and gimps.

652. James Hadden Young, of No. 66, College-street, Camden Town, in the county of Middlesex, for improvements in weaving.

653. Charles Hampton, of No. 61, Berwick-street, St. James, in the county of Middlesex, for improvements in piano-fortes.

654. Richard Wright, of Greenwich, in the county of Kent, for improvements in shafts and plummer-blocks.

655. Robert Booty Cousens, of No. 50, Halliford-street, in the county of Middlesex, for improvements in machinery for cutting cork.

656. Admiral the Earl of Dundonald, of Belgrave-road, in the county of Middlesex, for improving bituminous substances, thereby rendering them available for purposes to which they never heretofore have been successfully applied.

The above bear date November 5th.

657. John Melville, of Porchester-terrace, in the county of Middlesex, Esq., for improvements in the application of iron, and of wood combined with iron or other substances, to buildings and other constructions.

658. John Ryall Corry, and James Barrett Corry, of Queen Camel, in the county of Somerset, leather dressers and glovers, for a new method of sewing gloves.

659. John, Edward, and Charles Gosnell, brush manufacturers, of No. 12, Three King Court, Lombard-street, City of London, trading under the style or firm of John Gosnell and Co., for certain improvements in brushes.

660. James Nichol, of Edinburgh, Scotland, bookseller, for certain improvements in the process of graining or ornamenting surfaces and fabrics.

661. Francis Bywater Frith, of Salford, in the county of Lancaster, manager, for certain improvements in machinery or apparatus for dressing, machining, and finishing velvets, velveteens, cords, beaverteens, and other descriptions of fustian goods.

662. Peter Fairbairn, of Leeds, in the county of York, machinist, and John Hargrave, of Kirkstall, in the said county, manufacturer, for certain improvements in machinery for opening, combing, and drawing wool, flax, and other fibrous materials.

663. Joseph Victor Augier, of No. 39, Rue de Chabrol, Paris, for improvements in the manufacture of gas, and in the machinery or apparatus employed therein.

664. John Arthur Phillips, of No. 8, Upper Stamford-street, Blackfriars, in the county of Surrey, for improvements in purifying tin.

665. Thomas Hicks Chandler, of Aldbourn, in the county of Wilts, for improvements in hoes.

666. Benjamin Baillie, of No. 118, Wardour-street, Soho, in the county of Middlesex, for improvements in apparatus for drawing off and registering the flow of fluids.

667. William Frederick De la Rue, of Bunhill-row, in the county of Middlesex, and George Waterston, of Edinburgh, for improvements in writing cases.

668. Charles Frederick Day, of Ashford, Kent, and John Laylee, of Rye, Sussex, for certain improvements in sleepers and other parts of the permanent ways of railroads.

669. Jacques Morel, of Lyons, in the Republic of France, pattern-drawer, for improvements in figure-weaving.

The above bear date November 6*th.*

670. Charles Troupeau, of Paris, for an improved diurnal reflector.

671. George James Walker, of Norton Folgate, in the county of Middlesex, carriage builder, for certain improvements in gigs and other carriages.

672. Stephen Carey, of Great Guildford-street, Southwark, in the county of Surrey, builder, for certain improvements in the construction of viaducts, arches, bridges, and other buildings, upon a non-expansion principle.

673. James Brodie, of Bow of Fife, in the county of Fife, Scotland, clerk, for certain improvements in the propulsion of seagoing vessels.

674. Peter Fairbairn, of Leeds, in the county of York, machinist, for certain improvements in the ordinary screw-gill machinery, when applied to the purposes of drawing, combing, and heckling fibrous materials.

675. Jonathan Sparrow Crowley, of Lavender Hill, in the county of Surrey, civil engineer, for improvements in the means of, or apparatus for, working the signals and switches on railways.

676. William Edward Newton, of the Office for Patents, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the manufacture of the carbonates of soda.

677. Andrew Robeson, junior, of Newport, in the State of Rhode Island, and United States of America, for an improved mode of bowking or bucking cloth.

678. Robert Isaac Longbottom, of Regent-street, in the county of Middlesex, Gent., for improvements in preventing vibration in railway and other carriages, and in axles.

679. Stanislaus Hoga, of Nassau-street, in the county of Middlesex, Gent., for an instrument for ascertaining the existence of gold in the earth.

The above bear date November 8*th.*

681. James Arnold Heathcote, at present residing in Hackney, in the county of Middlesex, mate in the Indian Navy, for certain

improvements in the mode of exhausting syphons or pipes for drawing off fluids.

682. Mark Newton, of Tottenham, in the county of Middlesex, builder, for certain improvements in the construction of carriages, and in the means of preventing the overturning of the same when horses take fright.

683. Jean Jacques Ziegler, of Guebwiller, in the Department du Haut Rhin, in the republic of France, engineer, for certain improvements in machinery for preparing to be spun cotton, wool, silk, silk waste, flax, tow, and other fibrous substances.

685. Robert Knowles, of Chorlton-upon-Medlock, in the county of Lancaster, mechanic, for certain improvements in boilers and apparatus for generating steam.

686. Nelson McCarthy, of Cork, in the county of Cork, for improvements in boots and shoes.

687. Alfred Waterhouse, of the firm of Dakin and Co., St. Paul's Churchyard, London, for an improved filtering-pot.

688. George Shadforth Ogilvie, of Stapleton, near Bristol, in the county of Somerset, Gent., for improvements in candlesticks and lamps.

689. Thomas Revis, late of Cambridge, in the county of Cambridge, but now of Stockwell, in the county of Surrey, agricultural machinist, for improved single seed drilling or dibbling machinery.

690. James C. Booth, of the city and county of Philadelphia, in the State of Pennsylvania, United States of America, chemist, for manufacturing chromate and bichromate of potash from chromic iron or chrome ore.

691. William Gossage, of Widnes, in the county of Lancaster, manufacturing chemist, for improvements in obtaining sulphur from certain metallic sulphurets.

692. William Edward Newton, of the Office for Patents, No. 66, Chancery-lane, in the county of Middlesex, civil engineer, for improvements in the construction of axles or axletrees.

693. William Tudor Mabley, of Manchester, in the county of Lancaster, patent agent, for improvements in ornamenting glass, and other transparent, or partially transparent substances for windows and for other purposes.

694. Charles Griffin, of Leamington Spa, in the county of Warwick, Gent., for improvements in apparatus for fixing type or printing surfaces in a chase.

695. Robert Buncombe Evans, of Colyton, in the county of Devon, for improvements in the manufacture of charcoal.

696. John Down Gordon, of Eldon-street, Finsbury, in the county of Middlesex, piano-forte manufacturer, for improvements in tuning pianofortes.

697. Obed Hussey, of Manchester, in the county of Lancaster, for improvements in reaping machines.

698. Oswald Dodd Hedley, of Newcastle-upon-Tyne, for improvements in getting coals and other minerals.

The above bear date November 9th.

699. Charles Fox, of Scarborough, in the county of York, manufacturing chemist, for improvements in the extraction or rendering of oil from fatty or oleaginous matters.

700. William Johnson, of Lincoln's-inn-fields, civil engineer, for improvements in machinery or apparatus for sewing,—being a communication.

701. John G. Guinness, of Lisson-grove, London, Gent., for an improved mode of heating by air.

702. Joseph Tringham Powell, of Fenchurch-street, for improvements in mixing, baking, and drying materials in the making of biscuits and other articles where plastic matters are employed.

703. Auguste Baboneau, manufacturer, of Paris, in the French Republic, for an improved apparatus for melting and mixing asphalt with bitumen and other substances.

704. Louis Gabriel Guérin, of Paris, Gent., for improvements in fire-places.

The above bear date November 10th.

705. Bobert Hawkins Nicholls, of Bedford, Gent., for the invention of stopping railway carriages.

706. Ernst Luedeke, of Bedford-street, Strand, clock-maker, for improvements in obtaining and applying motive power.

709. George Lucas, of Kennedy-street, Manchester, engraver, for a composition for filling engraved cast or sunk letters, devices, or ornaments on or in brass, zinc, or other metallic plates.

710. James Noble, of Leeds, manufacturer, for improvements in combing wool and other fibres.

711. Colin Mather and William Wilkinson Platt, of Salford Iron Works, Salford, millwrights and engineers, for improvements in machinery for finishing linen, cotton, and other fabrics.

712. Christian Sharps, of Hartford, in the United States of America, for improvements in breech-loading fire-arms.

713. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in machinery or apparatus for sewing and stitching, —being a communication.

714. Henry Huart, of Cambrai, France, for improvements in the storing and preservation of grain.

715. James Cowan Wyper, of Glasgow, stationer, for improve-

ments in the figuring and ornamentation of book-bindings, and covers of a similar character.

717. William Davis, of Leeds, machinist, for improvements in machinery for cutting files.

The above bear date November 11th.

718. William Edward Middleton, of Birmingham, engineer, for a new or improved circular saw-bench.

719. Sir Charles Fox, Knight, of New-street, Spring-gardens, for improvements in roads,—being a communication.

720. Henry Fletcher, of Manchester, engineer, for improvements in the application of electro-magnetism for the production of motive power.

721. Caleb Bloomer, of West Bromwich, for improvements in the manufacture of anchors.

722. George Kendall, of the City of Providence, in the United States of America, Gent., for certain improvements in apparatus to facilitate the manufacturing of mould candles.

723. Daniel Henwood, of Charlton-street, Somers Town, for improvements in machinery for registering the number of passengers or persons entering public vehicles or vessels, theatres, bridges, or other places where it may be desirable to ascertain the number of persons entering therein.

724. Charles Seaton, of Fitzroy-street, Fitzroy-square, Esq., for improvements in the manufacture of metal tubes, and in the machinery employed therein.

725. Julien François Belleville, of Paris, manufacturer, for improvements in generating steam for producing motive power or heat.

726. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in reaping machines and in apparatus connected therewith,—being a communication.

727. John Henry Johnson, of Lincoln's-inn-fields, Gent., for improvements in measuring and registering the flow of fluids,—being a communication.

728. George Stenson, of Northampton, engineer, for improvements in apparatus for separating gold from auriferous sand and earth.

729. Thomas Day, of Upper Mall, Hammersmith, coal-merchant, for improvements in landing and screening coals, and delivering them into sacks.

The above bear date November 12th.

List of Patents

That have passed the Great Seal of IRELAND, from the 17th October to the 17th November, 1852, inclusive.

To Charles James Pownall, of Addison-road, in the county of Middlesex, Gent., for improvements in the treatment and preparation of flax and other vegetable fibrous substances.—Sealed 22nd October

Alexander Mills Dix, of Salford, in the county of Lancaster, brewer, for certain improvements in artificial illumination, and in the apparatus connected therewith; which improvements are also applicabe to heating and other similar purposes.—Sealed 22nd October.

Thomas Wilks Lord, of Leeds, in the county of York. flax and tow machine-maker, for improvements in machinery for spinning, scutching, heckling, and preparing of flax, tow, hemp, silk, cotton, and other fibrous substances, and for the lubrication of the same, and other machinery,—being a communication.—Sealed 22nd October.

List of Patents

Granted for SCOTLAND, from the 22nd October to the 22nd November, 1852.

To William Charles Scott, of No. 7, Wallham Cottages, Warner-road, Camberwell, Surrey, for improvements in the construction of omnibusses; applicable also to other public and private vehicles (going over again).—Sealed 25th October.

James Stevens, of Birmingham, glass manufacturer, for certain improvements in lamp-glasses.—Sealed 5th November.

Richard Archibald Brooman, of the firm of J. C. Robertson and Company, of 166, Fleet-street, London, for improvements in knitting machinery,—being a communication.—Sealed 12th November.

Richard Roberts, of Manchester, engineer, for certain improvements in and applicable to boats, ships, and other vessels.—Sealed 12th November.

John Mason, of Rochdale, machine-maker, and George Colliier, of Halifax, Yorkshire, manager, for certain improvements in preparing, spinning, twisting, doubling, and weaving cotton, wool, and other fibrous materials; also in tools or apparatus

for constructing parts of machines used in such manufactures. —Sealed 16th November.

William Edward Newton, of the Office for Patents, 66, Chancery-lane, civil engineer, for improvements in constructing fences, —being a communication.—Sealed 17th November.

William Rettie, of Aberdeen, lamp manufacturer, for certain improvements in lamps and burners; in apparatus for ventilating apartments; and in the mode of working signal lamps.—Sealed 17th November.

William Cook, of the town or borough of Kingston-upon-Hull, working copper smith, for certain improvements in the construction of steam-engines, consisting of a rotatory circular valve, for the regular admission of steam from the boiler, alternately, into the chambers of the two cylinders of double-acting engines.—Sealed 17th November.

George Pearson Renshaw, of the Park, Nottingham, civil engineer, for improvements in cutting and shaping.—Sealed 18th November.

William Church, civil engineer; Samuel Aspenall Goddard, merchant and manufacturer; and Edward Middleton, manufacturer, for improvements in fire-arms and ordnance, and in projectiles to be used with such or the like weapons; and also improvements in machinery or apparatus for the manufacture of part or parts of such fire-arms, ordnances, and projectiles,—being partly a communication.—Sealed 22nd November.

New Patents
SEALED IN ENGLAND.
1852.

To Joseph Walker, of Dover, in the county of Kent, merchant, for improvements in treating cotton seeds, in obtaining products therefrom, and in the processes and machinery employed therein; parts of which improvements are applicable to distillation,—being partly a communication. Sealed 2nd November—6 months for inrolment.

Patrick Mc Anaspie, of Liverpool, Gent., for a new manufacture of Portland stone, cement, and other compositions for general building purposes and hydraulic works. Sealed 2nd November—6 months for inrolment.

John Crowther, of Huddersfield, in the county of York, for a self-acting hydraulic crane or engine for lifting weights; such weights, when lifted, to be used as motive power, as also for

loading and unloading vessels and vehicles. Sealed 2nd November—6 months for inrolment.

Louis Arnier, of Rue Loisir, Marseille, in France, engineer, for certain improvements in steam-boilers. Sealed 6th November —6 months for inrolment.

Pierre Armand Le Comte de Fontainemoreau, of South-street, Finsbury, for certain improvements in the manufacture of certain articles of dress,—being a communication. Sealed 6th November—6 months for inrolment.

Charles Liddell, of Abingdon-street, in the City of Westminster, Esq., for improvements in electric telegraphs,—being a communication. Sealed 11th November—6 months for inrolment.

John Weems, of Johnstone, in the county of Renfrew, North Britain, tin smith, for improvements in the manufacture or production of metallic pipes and sheets. Sealed 11th November—6 months for inrolment.

Andrew Fulton, of Glasgow, in the county of Lanark, North Britain, hatter, for improvements in hats and other coverings for the head. Sealed 11th November—6 months for inrolment.

William Petrie, of Woolwich, in the county of Kent, civil engineer, for improvements in obtaining and applying electric currents, and in the apparatus employed therein; part or parts of which improvements are applicable to the refining of certain metals, and to the production of metallic solutions, and of certain acids. Sealed 13th November—6 months for inrolment.

Auguste Edouard Loradoux Bellford, of 16, Castle-street, Holborn, in the City of London, for improvements in the construction of springs for railway and other carriages,—being a communication. Sealed 25th November—6 months for inrolment.

Moses Poole, of the patent office, London, Gent., for improvements in elastic ribs, sticks, strips, and fillets used in the manufacture of umbrellas, parasols, and various other articles, in substitution of whalebone and steel, heretofore employed,—being a communication. Sealed 27th November—6 months for inrolment.

Lewis Pocock, of Gloucester-road, Regent's Park, in the county of Middlesex, Gent., for improvements in rendering sea and other water pure,—being a communication. Sealed 27th November—6 months for inrolment.

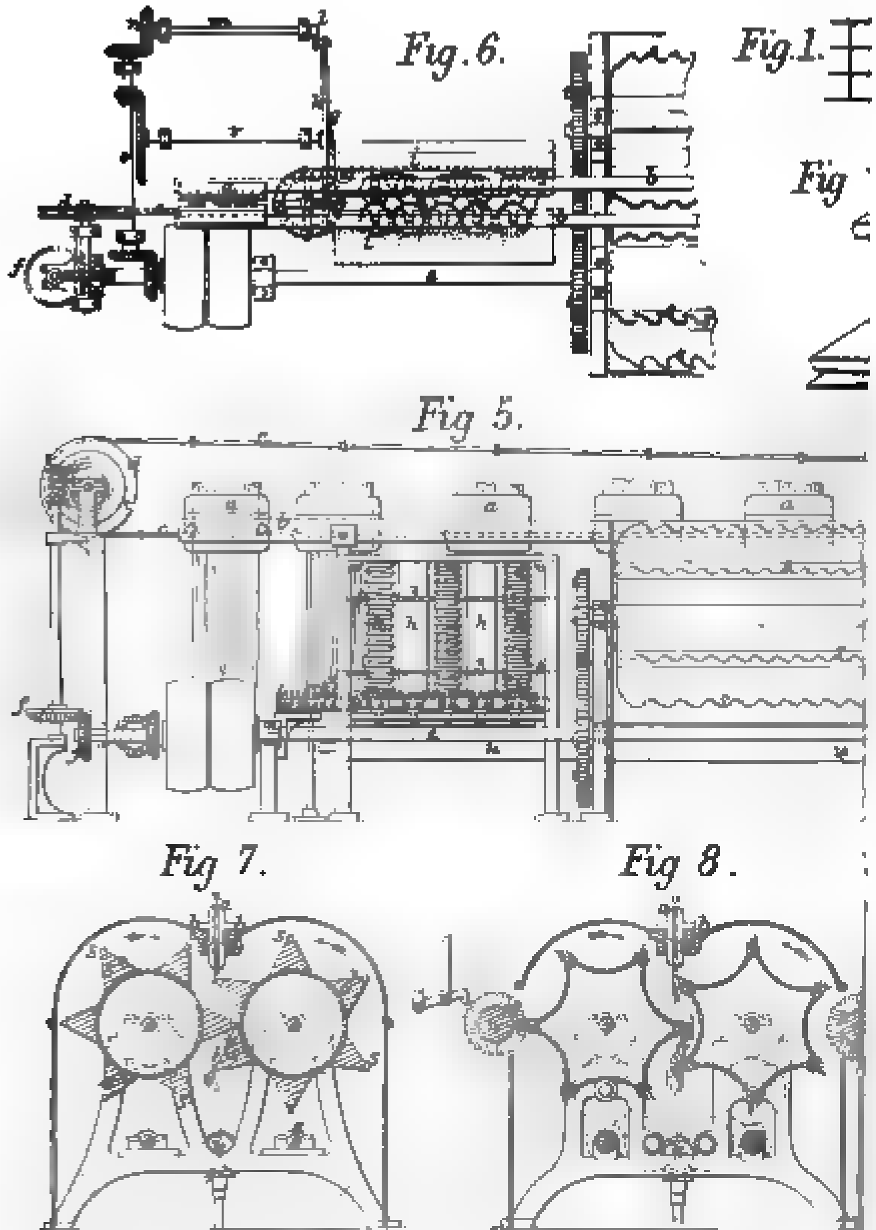
CELESTIAL PHENOMENA FOR DECEMBER, 1852.

D.	H.	M.	
1			Clock after the ☉ 10m. 36s.
—			☽ rises 8h. 1m. A.
—			☽ pass mer. 3h. 23m. M.
—			☽ sets 11h. 43m. M.
2	10	8	☿ greatest elong. 21. 5. E.
4			Occul. γ Virginis, im. 15h. 20m. em. 16h. 12m.
	22		☽ in □ or last quarter
5			Clock after the ☉ 8m. 59s.
—			☽ rises Morn.
—			☽ pass mer. 6h. 47m. M.
—			☽ sets 1h. 27m. A.
6			Occul. 80, Virginis, im. 17h. 33m. em. 18h. 40m.
7	22	14	♀ in conj. with the ☽ diff. of dec. 2. 6. S.
9	3	26	♀ greatest hel. lat. N.
	6	0	☽ in Perigee
	19	33	♃ in conj. with the ☽ diff. of dec. 1. 22. S.
10			☉ eclipsed, invis. at Greenwich
—			Clock after the ☉ 6m. 46s.
—			☽ rises 6h. 52m. M.
—			☽ pass mer. 11h. 14m. M.
—			☽ sets 3h. 27m. A.
	16	12	☿ stationary
11	3	32	Ecliptic conj. or ● new moon
	11	5	♂ in conj. with the ☽ diff. of dec. 0. 37. S.
	20	5	☿ in conj. with the ☽ diff. of dec. 0. 17. N.
13	9	53	☿ in the ascending node.
15			Clock after the ☉ 4m. 24s.
—			☽ rises 11h. 42m. M.
—			☽ pass mer. 4h. 49m. A.
—			☽ sets 8h. 43m. A.
	16	23	☿ in conj. with ♂ diff of dec. 1 37 N.
16			Occul. r^1 Aquarii, im. 5h. 8m. em. 5h. 24m.
—			Occul. r^2 Aquarii, im. 6h. 14m. em. 7h. 26m.
17	23	36	☿ in Perihelion.
18			Mercury, R. A., 18h. 8m. dec. 21. 56. S.
—			Venus, R. A., 15h. 19m. dec. 16. 21. S.
—			Mars, R. A., 18h. 27m. dec. 24. 12. S.
—			Juno, R. A., 0h. 25m. dec. 8. 39. S.
—			Vesta, R. A., 2h. 17m. dec. 5. 34. N.

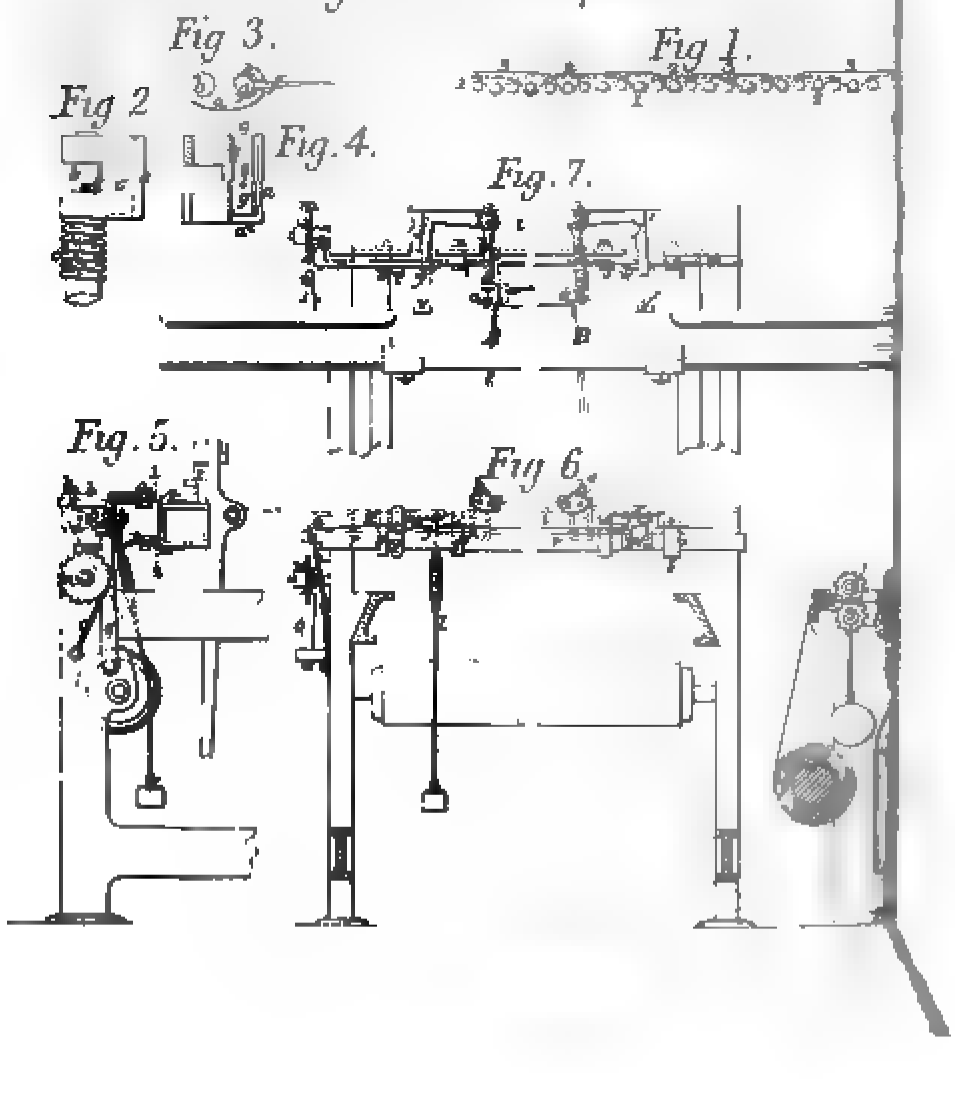
D.	H.	M.	
18			Pallas, R. A., 13h. 29m. dec. 4. 33. S.
—			Ceres, R. A., 13h. 51m. dec. 1 47. S.
—			Jupiter, R. A., 16h. 29m. dec. 21. 12. S.
—			Saturn, R. A., 2h. 39m. dec. 12. 57. N.
—			Uranus, R. A., 2h. 10m. dec. 12. 41. N.
—			Mercury pass mer. 0h. 19m.
—			Venus pass mer. 21h. 30m.
—			Mars pass mer. 0h. 38m.
—			Jupiter pass mer. 22h. 37m.
—			Saturn pass mer. 8h. 49m.
—			Uranus pass mer. 8h. 20m.
	8	39	☽ in □ or first quarter
20			Clock after the ☉ 1m. 55s.
—			☽ rises 1h. 15m. A.
—			☽ pass mer. 7h. 46m. A.
—			☽ sets 1h. 24m. M.
	5	9	☿ in inf. conj. with ☉
	22	18	♅ in conj. with the ☽ diff. of dec. 4. 8. N.
21	3	13	☉ enters Capri.—Winter commences
	6		☽ in Apogee
	13	45	♄ in conj. with the ☽ diff. of dec. 1. 32. N.
—			Occul. ε Tauri, im. 17h. 47m. em. 18h. 38m.
24			Vesta stationary
25			Occul. 1, Geminorum, im. 13h 49m., em. 14h. 11m.
—			Occul. 3, Geminorum, im. 16h. 27m. em 17h. 23m.
—			Clock before the ☉ 0m. 5s.
—			☽ rises 3h. 11m. A.
—			☽ pass mer. 11h. 33m. A.
—			☽ sets 6h. 59m. M.
26			☽ eclipsed, invis. at Greenwich
	1		Ecliptic oppo. or ○ full moon
28	7	36	☿ greatest hel. lat. N.
30			Clock before the ☉ 3m. 1s.
—			☽ rises 8h 20m. A.
—			☽ pass mer. 3h. 4s. M.
—			☽ sets 10h 49s. M.
	4	36	☉ in Perigee
	6	58	♃'s first sat. will im.
	15	10	☿ stationary.

J. LEWTHWAITE, Rotherhithe.

Browne's imp.ts in manufacturing



Shiers' & Heginbottom's imp.ts in looms &c.



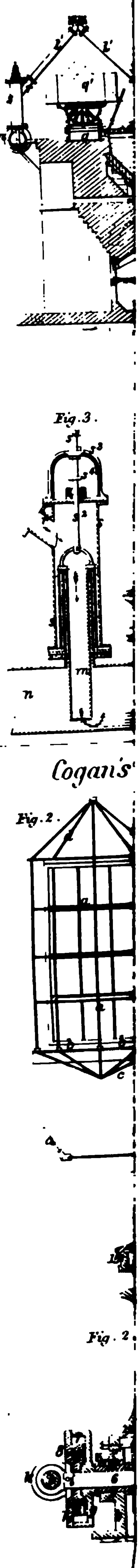
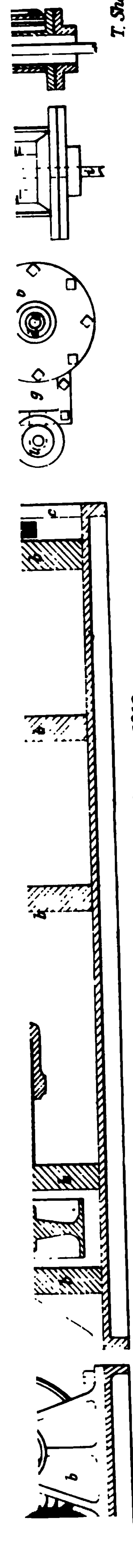


Fig. 3.

Cogan's

Fig. 2.

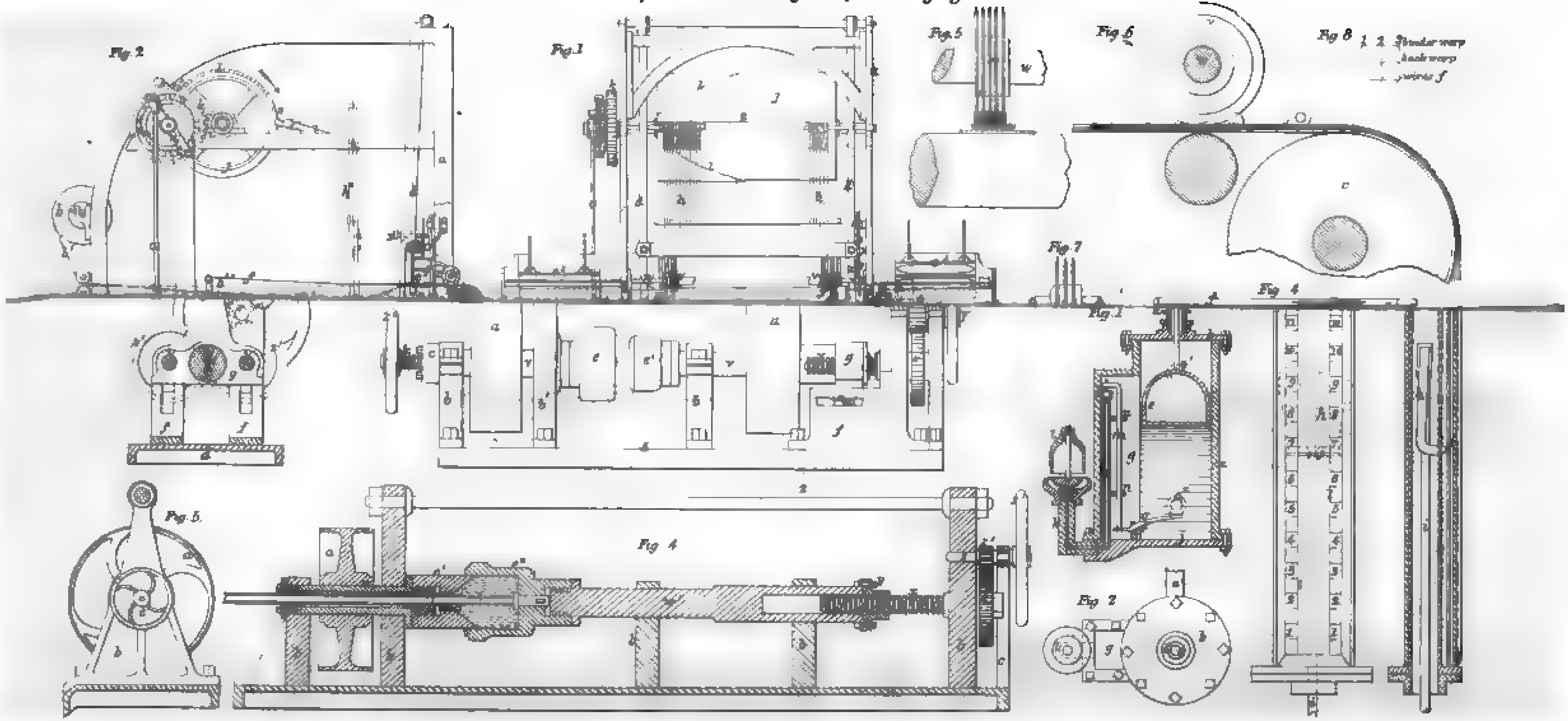
Fig. 2



T. Sherratt Sc.

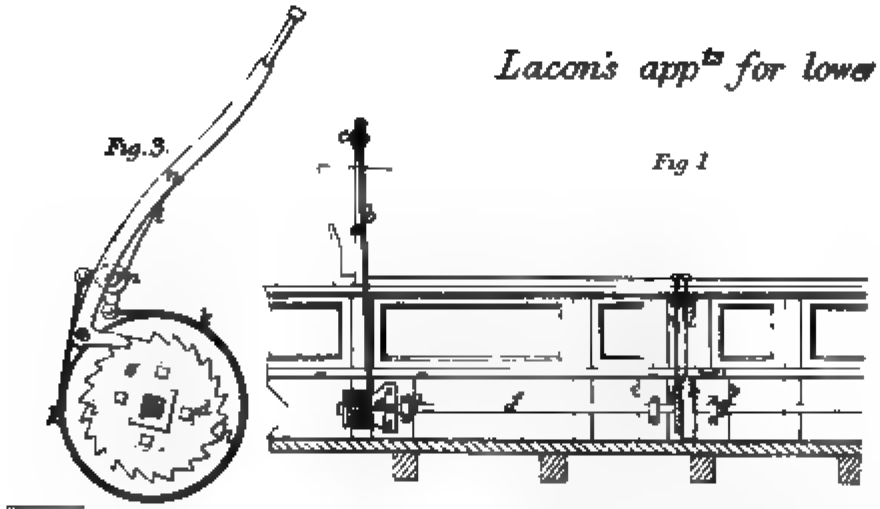
1st August 1852.

Sievier's imp.ts in weaving & printing fabrics

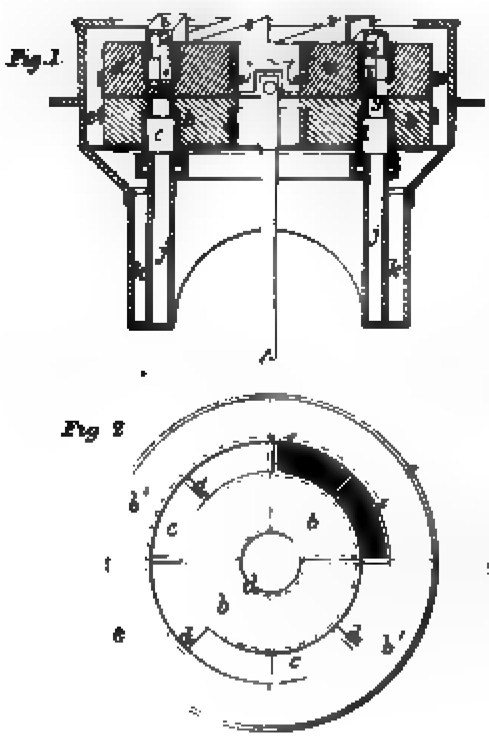


... del. 1st August 1862. T. Sherratt Sc.

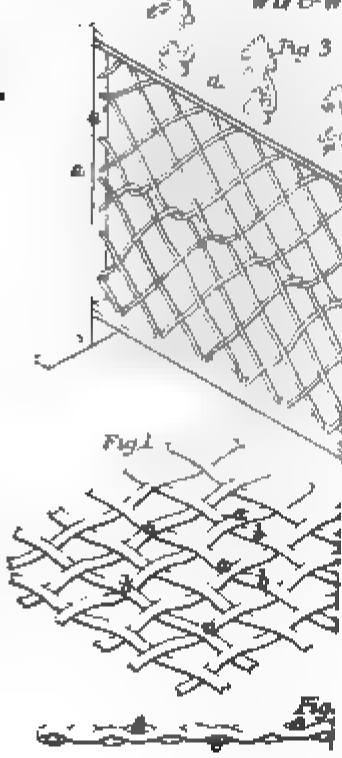
Lacon's app^ts for lower



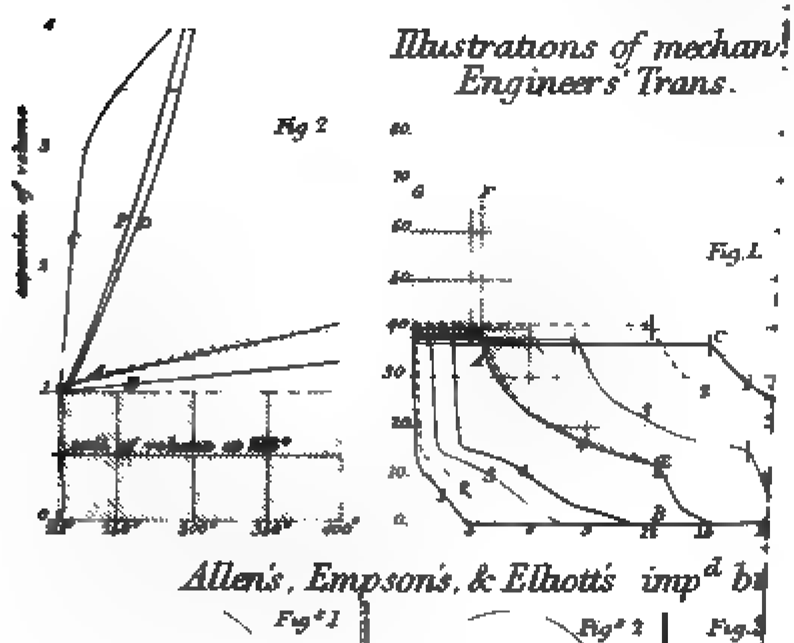
Barnett's imp^ts in mills



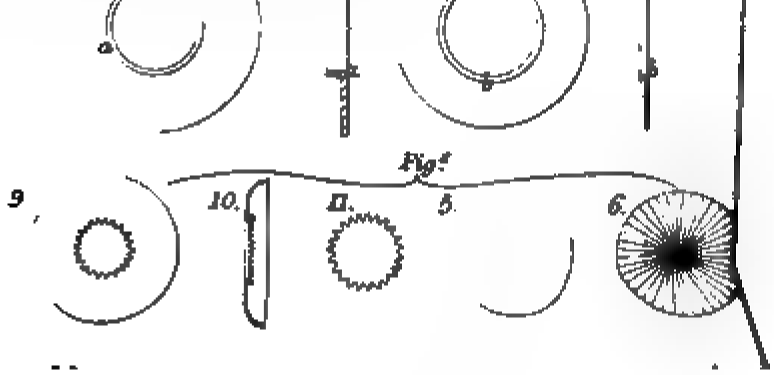
Newton's f...
wire-wo...



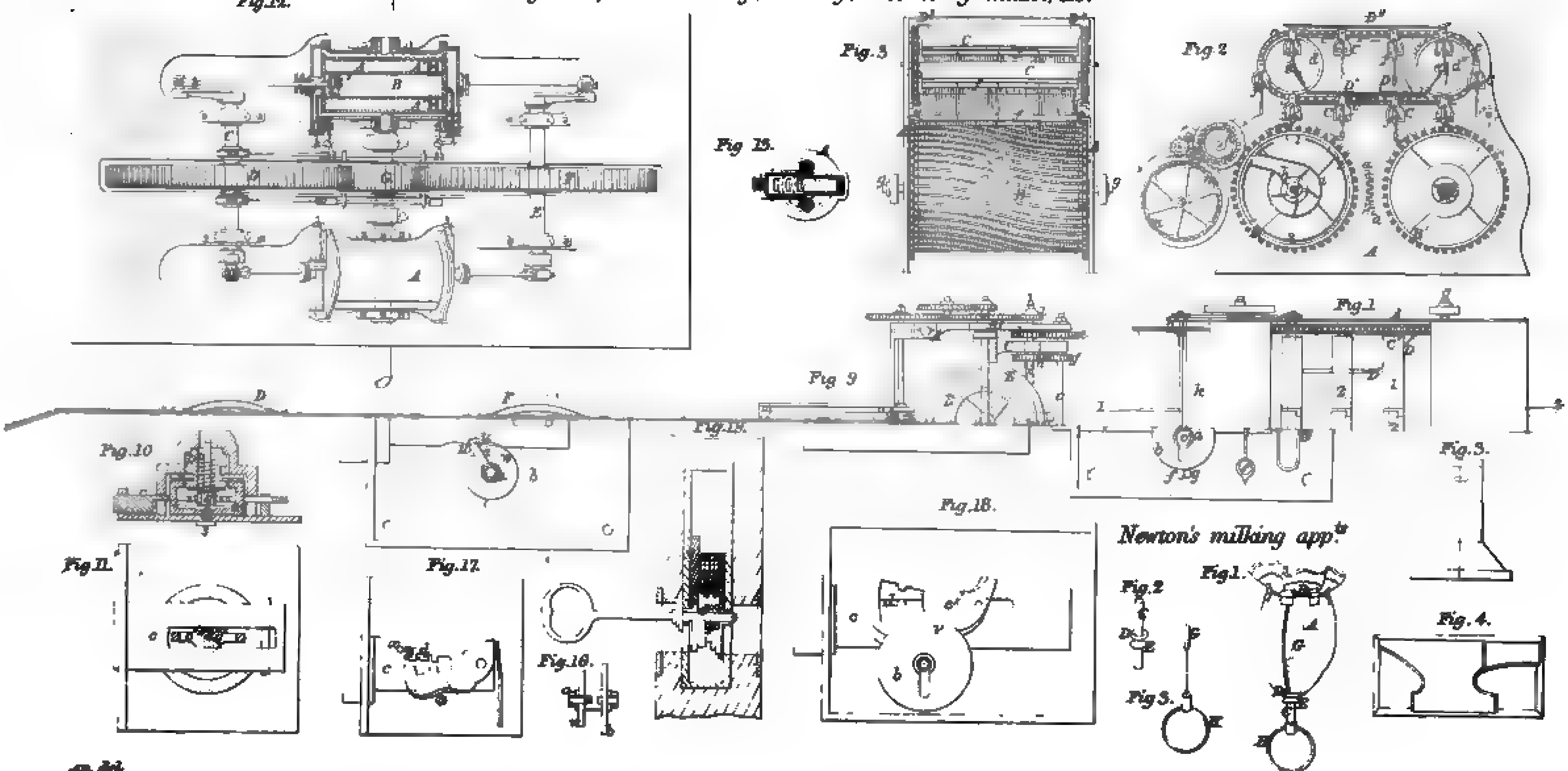
Illustrations of mechan...
Engineers' Trans.



Allen's, Empson's, & Elliott's imp^d b...



Harding's imp.ts in heckling, carding, & combing mach.y, &c.



Newton's milking app.s

J. H. del. 1st Sep. 1858 T. Sherratt Sc.

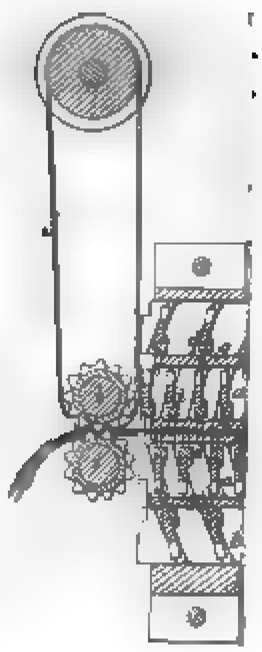


Fig. 4

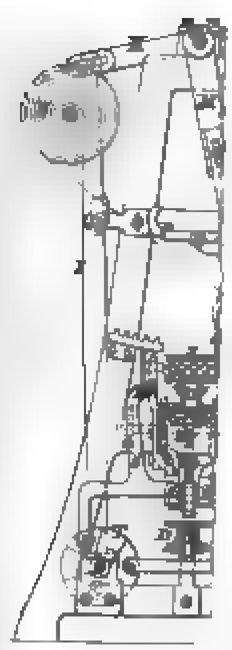
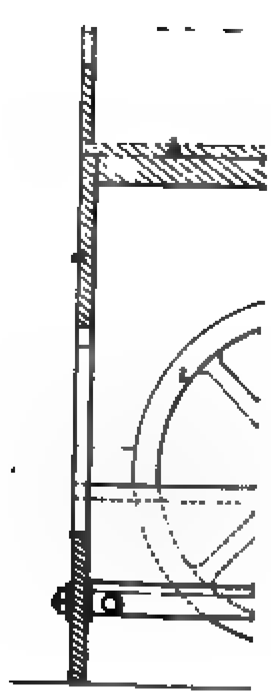
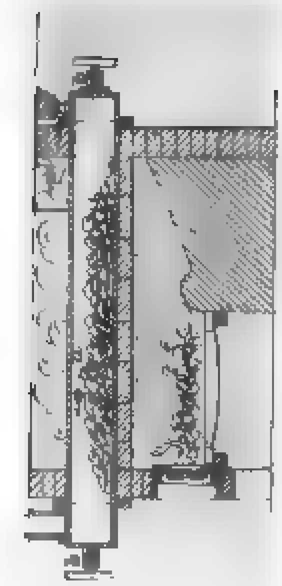
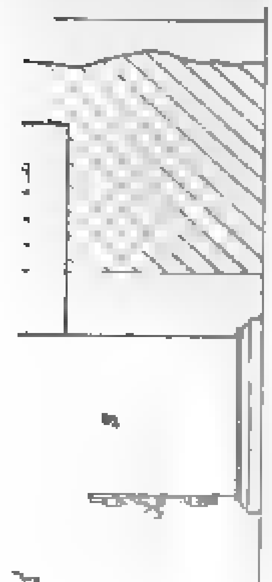
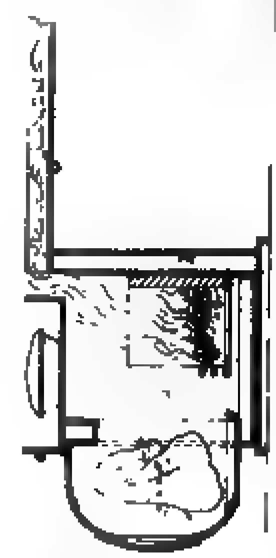


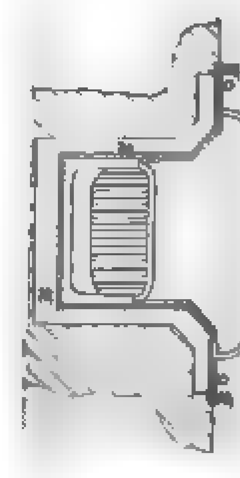
Fig. 1











[illegible] del.

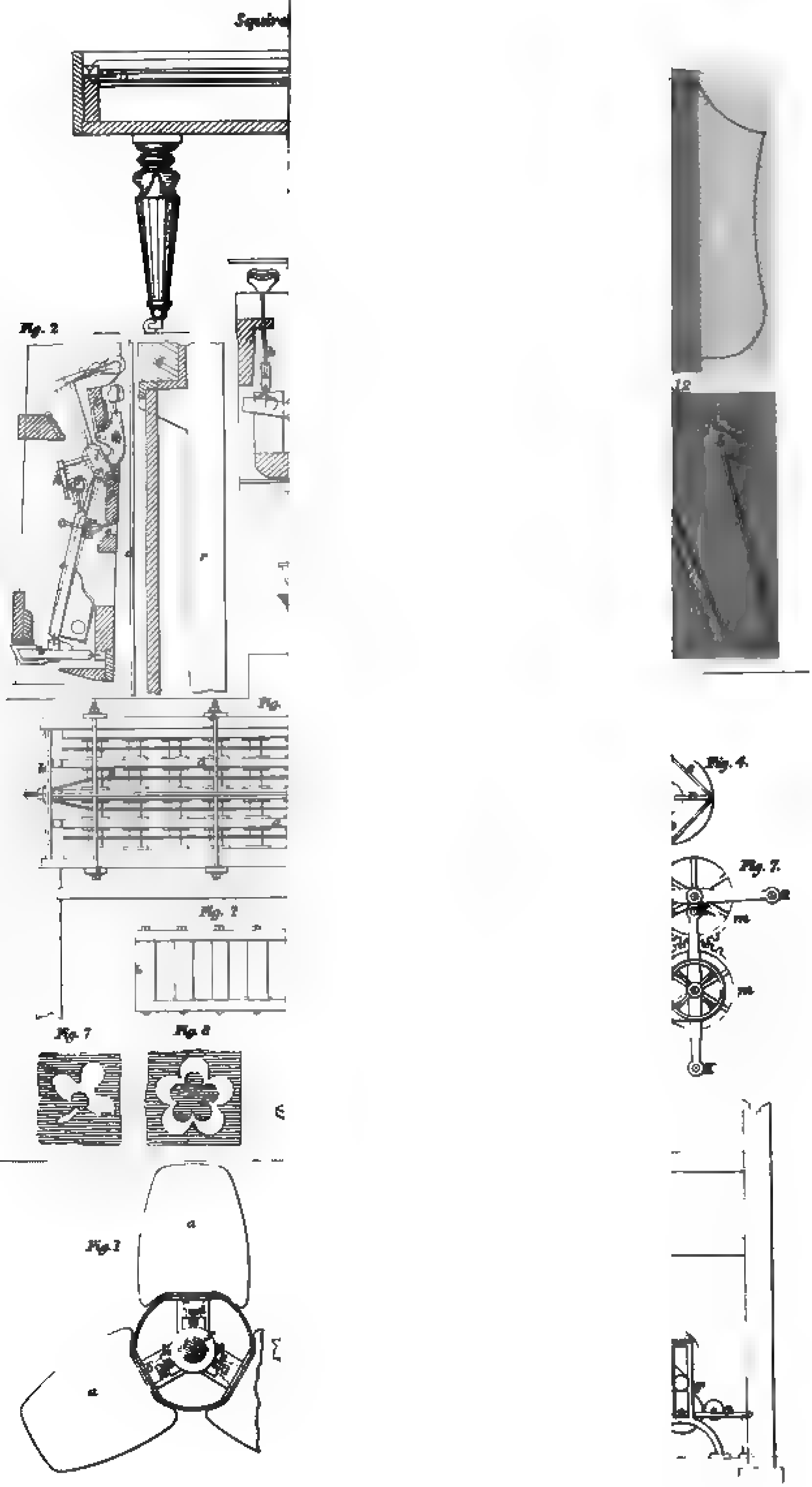
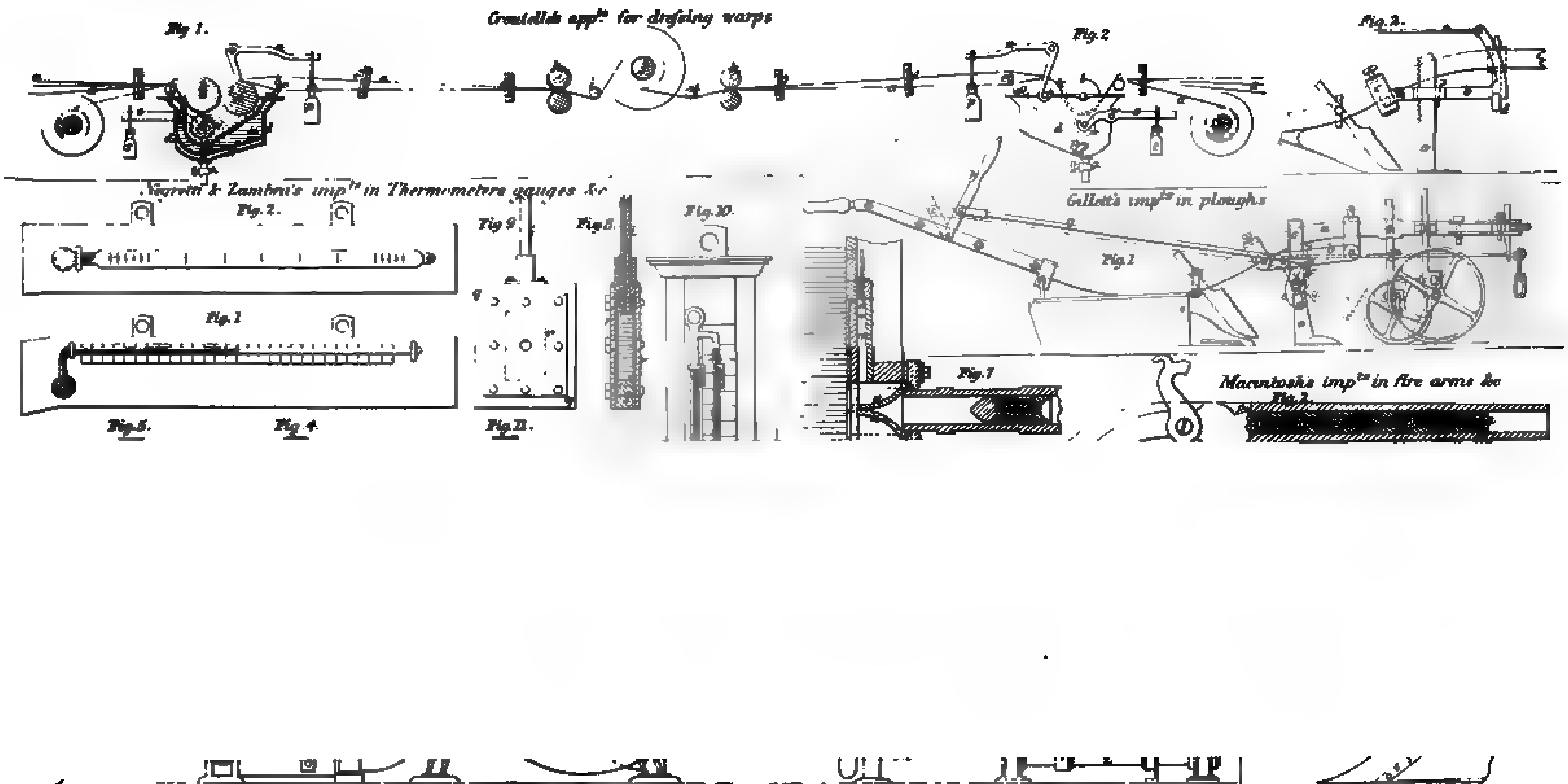
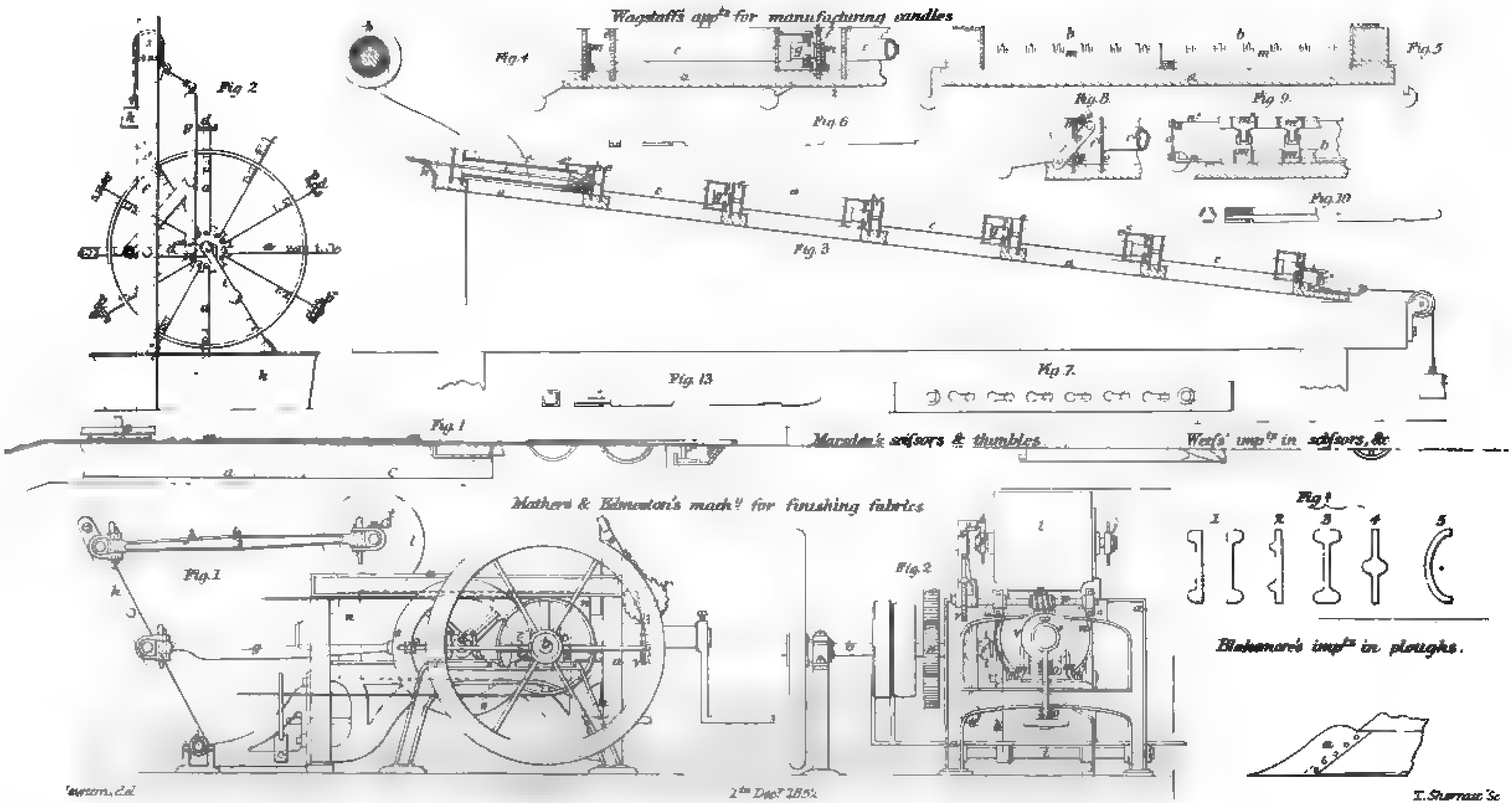


Fig. 2
Fig. 7
Fig. 8
Fig. 1
Fig. 4.
Fig. 7.



7th Decr. 1852.


Wagstaff's app^{ts} for manufacturing candles
Fig. 2
Fig. 4
Fig. 5
Fig. 6
Fig. 8
Fig. 9
Fig. 10
Fig. 3
Fig. 13
Fig. 7
Fig. 1
Marsden's scissors & thimbles
Weiss' imp^{ts} in scissors, &c
Mathers & Edmeston's mach^{y} for finishing fabrics
Fig. 1
Fig. 2
Fig. 1
1
2
3
4
5
Blakemore's imp^{ts} in ploughs.
2^{nd} Dec^{r} 1852
T. Sherman Sc